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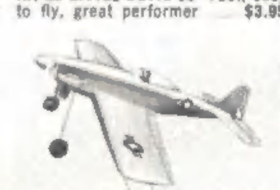
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# AMERICAN aircraft modeler


**COVER PHOTO:** Larry Renger holds the high-flying, radio-controlled Skydancer he developed for Estes. It is guided by aileron and elevator controls and launched by powerful rocket motor. See page 14. Transparency by John Simmonce.

**WILLIAM J. WINTER — PUBLISHER** **EDWARD C. SWEENEY, JR.—EDITOR**
**Kathryn Conover, Editorial Assistant** **Eleanor Swavely, Editorial Assistant**

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*Articles:*



*Features:*



*Academy of Model Aeronautics:*



*Departments:*



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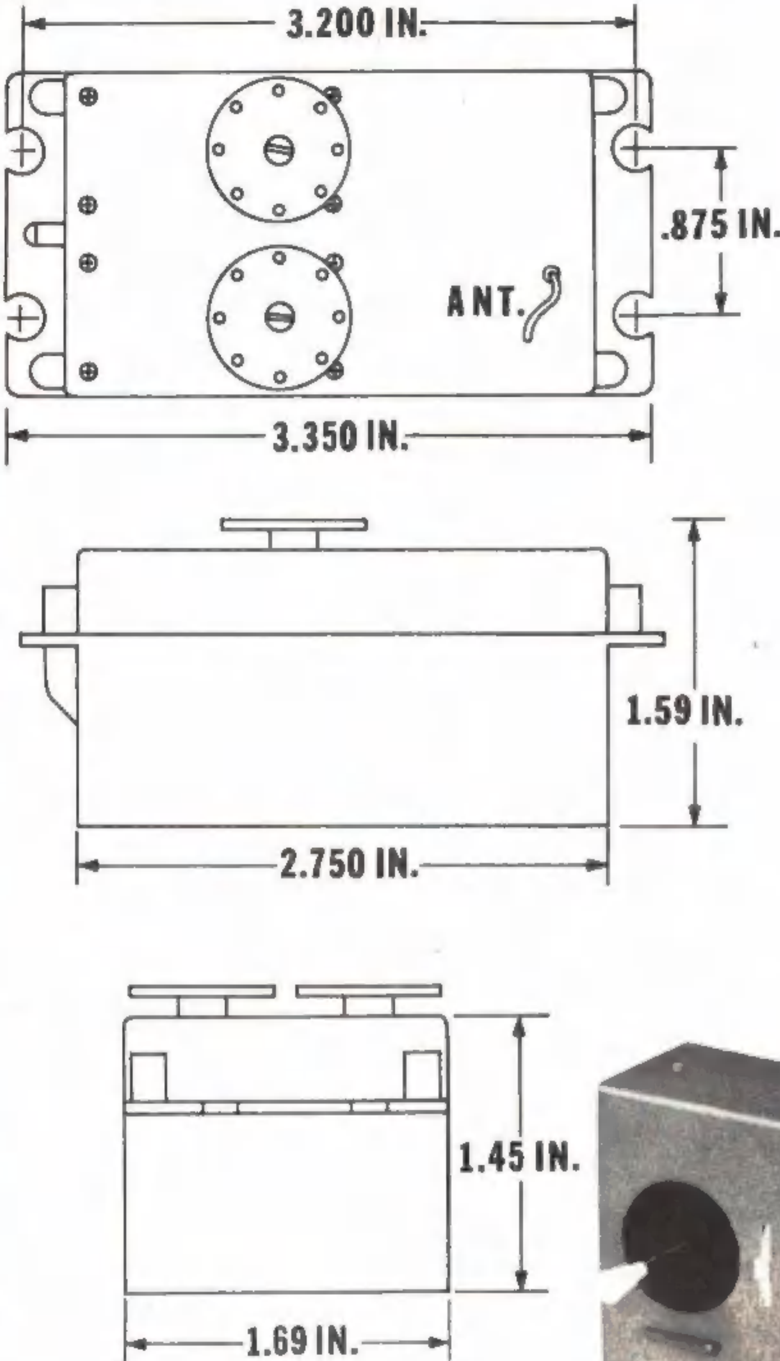



LIL' RED BRICK

ACTUAL SIZE



Editorial

# Straight...and Level

**The National Aerospace Education Council will be bankrupt, unless . . . .**

SINCE THE 1920's the model airplane industry, and the hobbyists themselves, have been continuously dedicated to the proposition that the numerous benefits and advantages of this splendid activity should be promoted for the welfare of American youth. Manufacturers have come and gone, the modes of building and flying have been continuously revolutionized. Counting the kids who buy simple ready-to-fly stuff, there are, perhaps, millions of people from several generations who enjoy this unique hobby. Many tens of thousands of these modelers have flown real aircraft, from veterans of World War II down to today's young students who associate models and real airplanes together as one thing–flying. Always, we have been in support of anything which advances aviation–big or little.

Now one of our greatest friends and allies, the National Aerospace Education Council, is dying. What is the NAEC? What does it do? Why is it dying? Must it die? For nearly twenty years, NAEC has been an active, non-profit, professional aerospace education organization. For two decades NAEC has promoted aviation and space education within the educational community and the public. Its scope is wide, its programs energetic and effective. In addition to the distribution of numerous NAEC free and low-cost aerospace publications, this altruistic and socially valuable organization answers yearly thousands of inquiries from the public, many of them regarding modeling. We know this from constant, firsthand experience in cooperating with NAEC. It even has established and encouraged various meetings throughout the United States, including a national congress for organizations active in aerospace education. It has been instrumental in obtaining a large-scale inclusion of aviation and space concepts in the curricula of many of our schools, and in the organization of a number of state aerospace education committees. It works with, and for, the aerospace industry, the airlines, general aviation, government agencies and the public. If a girl wants to be an airline hostess, she may ask NAEC for information. So does the boy who hopes to be a pilot or an engineer–or who wonders about model aviation. Now all of this trememdous effort may cease within months–and for the most ironic of reasons.

NAEC publishes or sells all manner of useful books, brochures, photos, as well as units, guides and aids for teachers. All these things are priced extremely low as a public service. As huge as is the demand, NAEC gains only half of its necessary operating budget from this service. The remainder of its operating budget has been made up for fifteen or more years by a subsidy–now $40,000–from the Aerospace Industries Association. It is that regular contribution which accounts for the low pricing of a broad spectrum of educational materials. Why has the Aerospace Industry Association withdrawn support?

Begin with the fact that layoffs in air and space industry amount to 300,000 people. Cutbacks in government planning, and in the business world, have had an awesome affect upon demand for products and services. Industry is cutting back so heavily in its promotion and advertising that several trade magazines have folded, and others may go. All are feeling the cut of the budgetary ax. The mighty Aerospace Industry Association is hamstrung in proportion to the fortunes of its member concerns.

While one would think AIA could ill afford to cut short without notice its assistance to non-profit NAEC to do for it the work it should do itself, but obviously does not, it is the dismal truth that not a farthing has been left to NAEC for the vital service it performs for all of us. NAEC, with only fifty percent of the money it requires to stay alive, will soon be bankrupt. It will never be adequately replaced. And aircraft modeling will lose much more than a mere friend.

Executive Director for NAEC is Walter Zaharevitz, who has always given his overwhelming task all he has got. He is a familiar sight at AMA Headquarters, always gung ho to get a modeling promotion on the road. His young sons are ardent modelers who cut their teeth on things like the AMA Delta Dart. "Ziggy" even tries his hand, but the kids are at least as good with sticks and glue as he is–which may or may not be news to him. President of NAEC is Dr. Mervin K. Strickler, Jr., who is a prime mover within the Federal Aviation Administration in Aerospace educational matters. "Merve" is leading a campaign for broad-based corporate sponsors and patrons of aviation and/or space education among the aerospace industry, airlines, general aviation and many related organizations. It is a monumental, desperate, and crucial campaign.

Elsewhere in this issue, and whenever space permits, **American Aircraft Modeler** will publish free advertising to promote NAEC's membership drive. We have advised the other publications in this field of the availability of our copy or negatives so that all of our modeling press can help in this drive to save something vitally important to America. –The Publisher

# You said it!

## Ott and the oldtimers

T.R. Perzentka's letter in the September issue brought back many memories. I haven't seen Joe Ott in many years, but Carl Goldberg's Comment some time ago was appropriate: that Joe hardly showed his age, compared to the rest of us, who only realize the change when we look at each other. More on Joe Ott: seems he served a hitch as a sergeant in the Army sometime after WW I and delighted the local kids and himself with fine flying stick and scale models which later were presented as plans, mostly half size, for five to ten cents. About 1931, he wrote a comprehensive book on models (most big libraries have it). Joe also had a model business selling his own products, including excellent compressed-air motors, plans, kits, etc., in Chicago.

Joe always stayed with the times and business competition, doing many magazine articles and becoming model editor of *Popular Aviation*, taking over from Bert Pond about 1930 (no trace of Bert can be found at the moment; I last saw him at the 1936 Nats).

About 1932 to 1934, Joe put out a series of 12-in. scale kits, sold at 25 cents in drug and grocery stores. He was then associated with Duncan (the yo-yo people). As things got worse in the Depression, Joe scouted for greener pastures, coming eventually to Western Coil and Electric Co. in Racine, Wisc.

Joe's ideas with W. T. Lewis's factory, tools and personnel began the production of the series mentioned by Mr. Perzentka—multi-colored boxes done by artists, blueprint plans, hand-sawed printed sheets, new-type machine-cut props, top grade balsa and complete excellent hardware.

The balsa that went into these kits would make tears come to your eyes today. I saw three-to four-lb. indoor stock, white and flawless, go into millions of kits which retailed for ten cents or a quarter. This series had four ten-cent numbers of about 18-in. span and four quarter numbers including biplanes of 22-in. span.

Joe continued to work with Lewis until about 1936 or 1937. Lewis continued to produce kits until the early 1950's and now is in the plastics (not airplane) business.

Joe went to Chicago and began again the production of a whole new series of jig-built models, gradually going into hardwood and cardboard as WW II came on.

I worked for Mr. Lewis for many years and did a number of the plans from 1940 until 1952. Another oldtimer, Dan Kilgore, is still somewhere around. Dan did many more kits than I, and I never came up to his superb drafting ability. Dan did many of the Paul Lindberg plans.

Anyone looking for old plans (reprints) may send 25 cents for a list to: John Pond, 4135 Avati Drive, San Diego, Calif. 92117. I send John anything I find and his list is long—thus we will not lose all this history.

I would appreciate hearing from anyone having pictures or information on any surviving member of the old Illinois Model Aero Club. Don Lockwood, who joined in 1922, is the only known real oldtimer surviving.

Four members (each 70 years of age or over) survive from the Milwaukee Model Aero Club. The two groups flew together in the era of 1914 to 1918.

**Jim Noonan, 7454 W. Thurston Cr., Milwaukee, Wisc. 53218**

## Necessity Dope

Living over here in the Bahamas, I find it extremely hard to acquire clear or colored dope. When it is available, clear runs as high as $2.75 per pint, and no thinner to boot. You can imagine how expensive it is to cover a model.

One day, not having come to any conclusion on how to acquire some clear dope to finish models which were lying around, I stumbled on a few words out of a modeling magazine: "Back in the good old days when film dissolved in acetone. . ."

Sure enough, through a series of trial and error experimentations, I came up with a fuel-proof dope.

I have covered entire models with Silkspan and silk with my Necessity Dope and the more I make, the better it becomes. Now, granted it isn't an Aero Gloss or Ambroid or Testors; but it is a Sayer and it works. It costs me two dollars a quart to make it here. I used one complete gallon to finish the Sterling CL Supermarine Spitfire, even putting talcum powder in it to make a filler. Pactra colored dope takes over it like a fish to water.

Would you believe that when the fuel from the engine hits this stuff, it actually gets a polish to it? It dries extremely fast, but various retardants such as castor oil and camphor oil are good, and it even works as a plasticizer. On silk it cures up to a real shiny surface.

**Capt. Jack Sayer, Nassau, Bahamas**

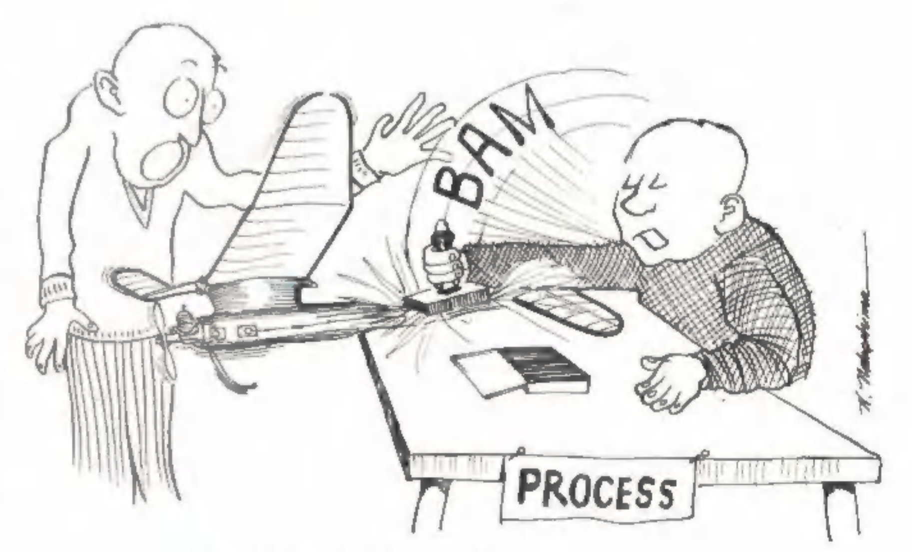
## Improvised Antoinette

Being a lover of airplanes, I saw the rerun of *Those Magnificent Men in Their Flying Machines* a few weeks ago. Then I remembered I had read an article in the September AAM on the Antoinette, the Englishman's aeroplane. I fell in love with the 60-year-old machine. So I looked in the back of the issue to see about the plans. *Nine bucks*! That's a lot, even for an adult.

As a financially weak 13-year-old, I had to do something if I wanted an Antoinette. So I improvised. Using the plan in the magazine (just the right size for rubber power) I broke out my precious scraps left over from kits and set to work. I made the fuselage from stringers and 1/16-in. sheet balsa. I traced the wing formers over carbon paper and cut them out.

The landing gear is made of thin wire wrapped together with glue-coated thread and small wheels from an old ready-to-fly model. The wings were held up with thin thread and turned out to be amazingly strong. The result was a fantastic little free flight job. It was very tail heavy, so I constructed a fake engine and fuel tank out of clay. It flies just like the prototype: smooth and slow.

*(Continued on page 12)*

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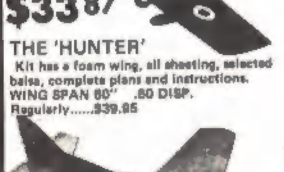

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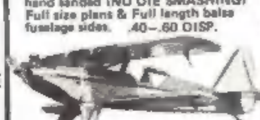

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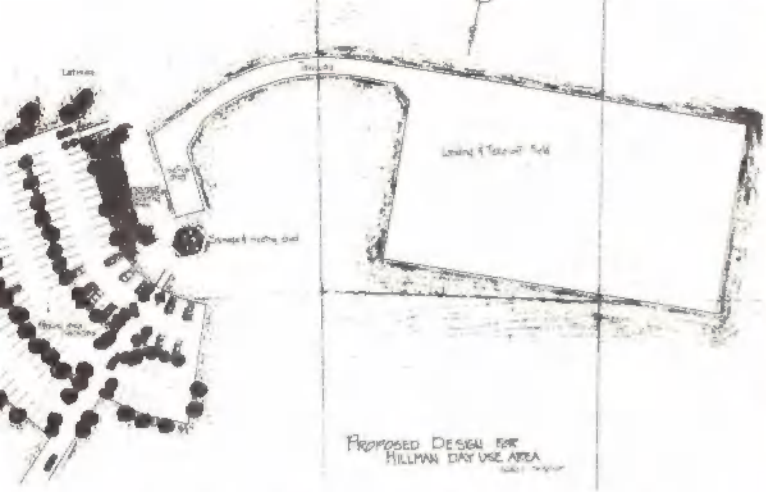



This fabulous RC flying site is well laid out and has plenty of pit space, a landing field, mounded spectator area, and parking space.

On the Scene

# Hillman Model Air Park

**ARCS club of Pittsburgh, Pa., has a most beautiful and permanent "noise park" for model airplane flying, thanks to a generous benefactor and the State.**

**ROBERT LOPSHIRE**

ANOTHER BIT OF MODEL aviation history was made in a relatively remote section of Washington County, adjacent to Pittsburgh, Pennsylvania.

On Oct. 4, 1970, a new 4000-acre state park was opened for public use. Of particular interest to modelers was the 200- by 350-foot asphalt takeoff and landing site, with accompanying taxiways, ready areas, mounded spectator area, large parking area, and rest room facilities. Best of all, the park was placed under the control of the Greater Pittsburgh ARCS! This flying site would make any radio control enthusiast seriously consider moving to Pittsburgh just to have the privilege of using it.

Those who would like to have similar facilities may wonder how the Pittsburgh ARCS achieved this enviable goal. First, the ARCS have what can only be called drive. They are a group that gets things done through organization. Thanks to their "get out and get it done" attitude, we all still have a Nats. It was the ARCS who developed and perfected the Delta Dart event and made history with it. The Darts saved the Nats by attracting youth to modeling—lest we forgot.

The ARCS also worked with youth in the Pittsburgh area and thereby attracted the attention of James F. Hill-

Club member and Majority Leader, State House of Representatives, K. LeRoy Irvis.

To give visitors some idea of how an RC plane is constructed, Dallas Hartford spent the day working on a Schoolmaster. It was not easy—wind was howling. No scraps were left.

Wayne Dempler and his son Price put on flying demonstrations with Dee Bee job.

Maynard Hill climbs spectator mound from which he flew his altitude record ship.

Despite park's remote location, spectators came from everywhere. Lots of models too.

Day's festivities included refreshments and [redacted] cake for the club members and officials.

man, [redacted] strip miner and philanthropist interested in youth activities. In 1946, Mr. Hillman gave ARCS the facilities to establish a model airport and through the years contributed greatly to the ARCS activities.

Mr. Hillman is one of those people we wish were more abundant. He declared that, in strip mining, a portion of the profits should be returned to the land, restoring it to its original condition for future generations. Therefore, he began a program of putting the strip mines his company had worked back into their original condition through filling and replanting of vegetation. Small wonder that, in 1969, James F. Hillman was given the Outstanding Citizen of Pennsylvania Award.

About this time, he also donated 4000 acres of reclaimed, former strip mine land to the state for use [redacted] a public park. In the meantime, the ARCS was caught up in the expansion of highways and housing developments which threatened to crowd them out of their long-established flying site. The club decided to ask for space [redacted] the newly donated land and, with Mr. Hillman's blessings, they arranged a meeting with Dr. Maurice K. Goddard, Pennsylvania Department of Forests and Waters, and other state representatives.

*(Continued on page 85)*

John Worth, John Patton, Wayne Dempler prepare to cut the opening ribbon.

The pit [redacted] with spectator hill to the right, a safe distance from the active flying area.

I had some heart-attack crashes, but Antoinette came out ok. I just love my scratch-built masterpiece: it is my proudest creation. It shows what you can do without spending money.

**Tony Belli, Sandusky, Ohio**

*Tony is to be congratulated on his resourcefulness in getting around the plan cost problem—and there is no [illegible] why anyone can't enlarge plans by various methods, including mechanical drafting, directly from the magazine. There are two basic methods by which a magazine can print plans. One is to actually print in quantity [illegible] large number of each plan, which either limits the paper size or results in high costs anyway, both for printing and shipping. The other method is [illegible] make limited runs of each plan, more or less on demand, by the ozalid method. This method could be loosely compared with making blueprint copies. When large quantities are printed, a publisher usually averages an inventory of from 40,000 to 60,000 plans, and needs a storage facility designed for quick servicing by extra employees. So most publications, here and abroad, prefer the ozalid system. However, charges to the publisher are based upon square feet of area of the plan, and anything as huge as the Antoinette necessarily is quite expensive. Handling of orders and correspondence, postage, etc., add to the problem. Anyone having his own pencil drawing of his own design on a see-through material can obtain an ozalid copy in his home town for a modest fee—but the quantity servicing of many orders through the mail is, unfortunately, an entirely different problem. One wishes prices could be lower. It is better to maintain [illegible] reader service, regardless of problems. Good show, Tony. —Publisher.*

## De-clutched roadable

The material on the Aerobile in your November issue was excellent, except for one statement. The propeller was never removed, as has been the case in other attempts to build roadable airplanes. It was de-clutched by providing for the slackening of the drive belts, and an automatic brake was provided to prevent "windmilling" while driving.

The published photo of the roadable portion, taken at Silver Hill, leads me to say that the plane is now fully assembled.

The machine at Silver Hill was number seven of the series, the first six being called Arrowbile. Number seven was three-place and had [illegible] 150-hp Tucker engine, instead of the Studebaker. The wing detaching mechanism was also greatly simplified.

**Waldo D. Waterman, Smithsonian Liason Committee, San Diego, Calif.**

## Variation on the Antoinette

I read with great interest the Antoinette article by Vernon Zundel and Al Signorino, [illegible] I have been an Antoinette enthusiast ever since I became interested in aviation. I was somewhat amused, however, by the mention of Bill Hannan's plans being three-views. Mr. Hannan and I have both made highly detailed rubber-powered models from these "three-views."

My Antoinette has been in pieces ever since the 1969 Flightmasters Scale Annual, when I attempted (!) to fly it. Mr. Hannan's much more beautiful Antoinette flew quite well at the 1967 Flightmasters, however, [illegible] I guess I will eventually have to persuade mine to fly, as I'm sure it should.

It was built to look like the original 1909 version, rather than like the "Magnificent Men" aircraft, and it appears that Mr. Zundel did an exceptionally fine job on his. The contrast in size is amazing. Mine spans 22 inches and weighs one and one-quarter ounces.

**Kelvin Pardoe, San Diego, Calif.**

## Whither the Dewoitine?

In reference to a letter from T. R. Perzentka in your "You Said It" column, September issue: Mr. Perzentka spoke of being near Joe Ott. Could he or another of your readers perhaps put me onto the trail of Dewoitine 520 plans?

Since Profile No. 135, I've drawn a complete blank. Most people don't even know what I'm talking about. I had one plastic model two years ago but can't even replace that. Any help would be most appreciated.

**Charles McCullough, 1021 Courtland, Lima, Ohio 45801**

## The direct route

It can be done—due in part to magazines like yours. I refer to leaping from nothing right into full-house radio control.

I became interested in RC flying by watching three or four local Sunday fliers. Asking questions and borrowing magazines, I suddenly developed "instant enthusiasm."

Impulsively ignoring advice to progress through control line, rudder only, et cetera, I decided to build a kit and, if the result resembled an airplane, to get a radio and engine. Having never built a flying model of any kind, I was overwhelmed by the myriad of pieces and the three-step procedures from parts to completed pieces that I found in my Sky Squire kit.

Every Sunday I barraged the local RCers with questions; my own "do-it-yourselfness" kept me from asking for any physical help. After about four weeks of evening and weekend work, I had something that resembled the picture on the box, despite a few leftover pieces of hardwood, balsa and nylon parts which I still cannot identify. Nevertheless, it looked like an airplane, so I bought a used O.S. Max 35 and a used Heathkit system and spend another week installing servos and pushrods.

Finally, one Sunday I took my blue and white MonoKoted Sky Squire out to the field. After some minor engine adjustments I put the transmitter in the hands of the local expert and requested his service for a test flight. When the plane was airborne, I tried to convince myself that I never doubted that it would fly. On the second flight, the expert handed me the transmitter and I performed a few dives and zooms (attempting level turns). The third flight I made my own takeoff for a flight of about five seconds duration, resulting in a smashed prop and cracked elevator. So much for the first day.

After [illegible] repair job and inspection, I tried again. I made a takeoff and staggered the Squire twice around the field. I terminated the flight with a stalled pancake landing in

(Continued on page 74)

# Skydancer

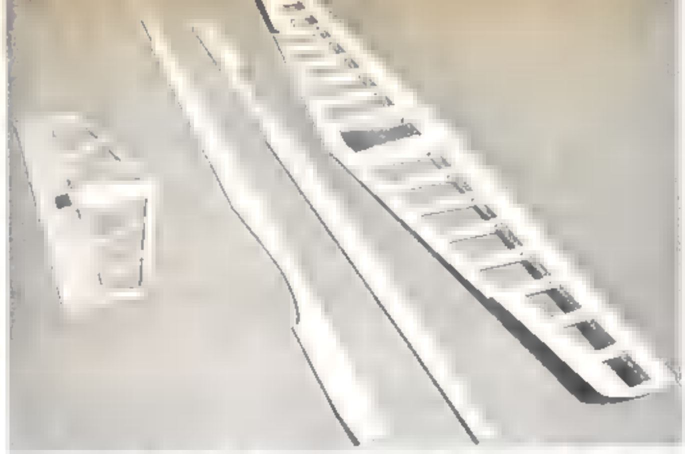
**Fascinating combination of space, aero, and RC flying. Nine-pound-thrust rocket motor sends this boost glider 200 feet straight up for long fast glide.**

**LARRY RENGER**

HAVE YOU EVER SEEN a big dual-digital-proportional model blast two hundred feet straight up under nine pounds of rocket thrust? Skydancer is just such a breakthrough in the wide-open field of RC boost-gliders. This model also has good duration coupled with aerobatic capability following that spectacular launch! Its graceful performance has earned it the name Skydancer.

This boost-glider is an experimental project by the Research and Development staff at Estes Industries and was originally conceived by John Simmance, Director of Model Products Development and five times champion in scale at the British Nationals. The design, construction and development of the model were assigned to me because my indoor model and free-flight experience would aid in design of a light airframe. I also had designed and flown RC slope soarers and had originated both the front-engined boost glider and the "pop-pod."

Although NARAM 12, the Rocket Nats, was but four weeks away when this assignment was given, it did seem possible to have the glider ready for a demonstration at that annual meet. Construction took two and one-half weeks from initial sketch to first flight, and Bert Striegler, Technical Editor for Continental Oil Company, was asked to fly Skydancer for a NARAM demonstration.



At last year's Rocketry Nats, the Skydancer [redacted] first flown in public. Hold up-elevator during thrusting, then turn into glide.

Skydancer is built like any model plane, but it must be stronger to withstand acceleration and high speed in launch.

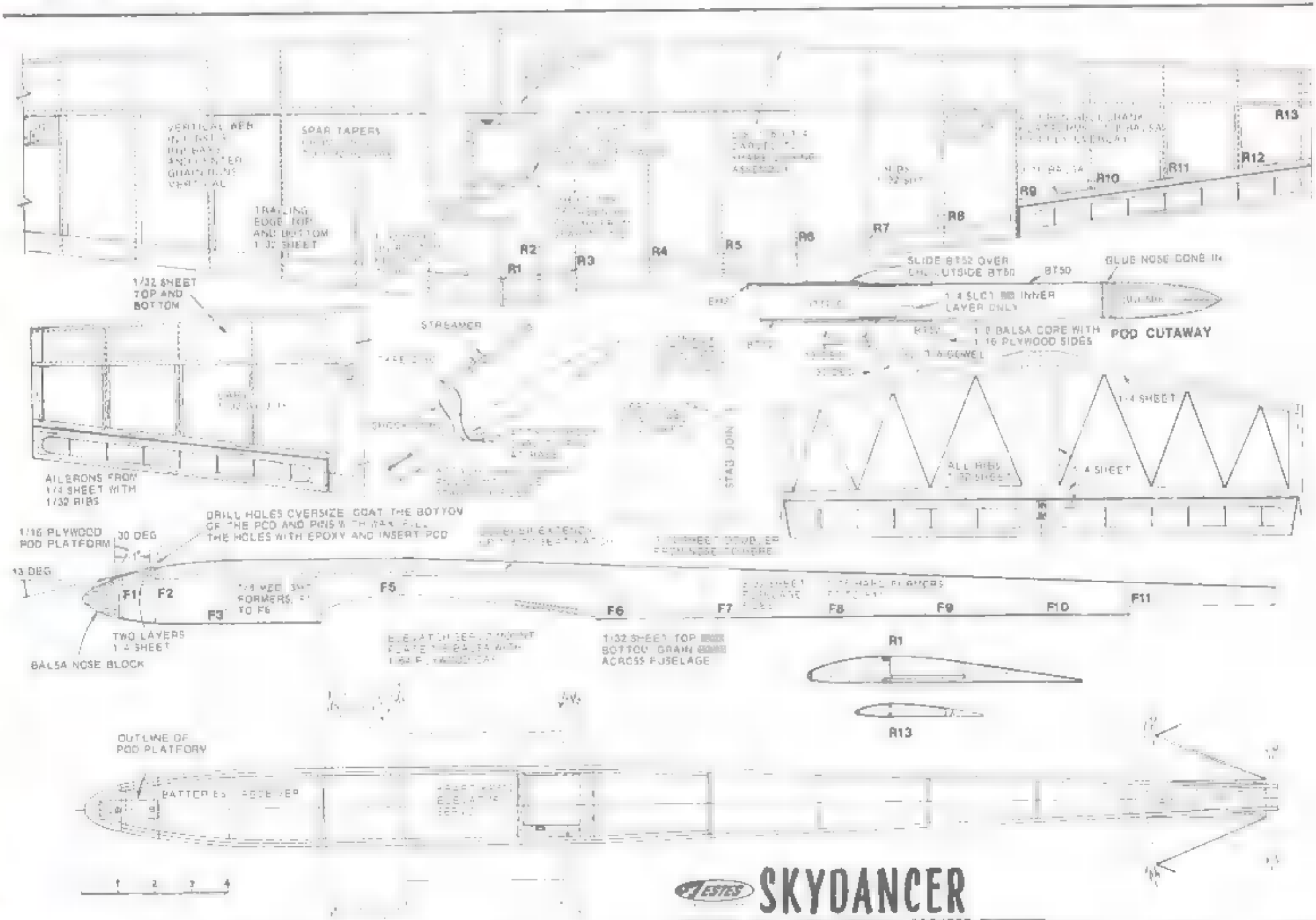
The model was test flown successfully several times at Estes' Penrose, Colo., test grounds. Then, just before Skydancer was to be shipped to the Houston contest site, its wing was destroyed when the ship collided with [redacted] power line. Enough had been learned by then to develop a new, larger wing. The old wing had [redacted] 36-in. span, which was now increased to 44 in. At the same time, ¾ oz. was cut out of the structure. After some late hours building, the improved model was sent off to NARAM 12 only one day behind schedule.

With the help of Bill Simon, Executive Director of Research and Development at Estes, Bert Striegler made several test flights and found no serious problems. Despite high winds on the day of the demonstration, Skydancer made a perfect flight before the assembly at NARAM—a satisfying milestone in an interesting project.

Normally, Skydancer is powered by a single D-13-3 Estes engine for [redacted] vertical flight of about 100 ft. The model is completely controllable, even during the boost phase. Transition to glide is easy and smooth. The best flight with the old 200-sq. in. wing at 12¾ oz. was 1:06. Using two-stage motors and the new wing, flight duration usually has been over two min., even with an occasional loop thrown in.

Two Kraft KPS-12 servos, one 225 mah battery pack and a Kraft three-channel receiver for an airborne weight of 6½ oz. provide aileron and elevator control. Although the equipment could have been modified to further reduce weight, flying with off-the-shelf gear was one of the project's goals. This model works quite well, but it is just a starting point. The structure can be lightened and the tradeoff of boost altitude versus glide must be investigated.

All recent flights have been with a D-13-0 booster taped behind the D-13-3. This is not legal for the NAR, nor is it good practice. A true, legal, two-stage *(Continued on page 87)*




ESTES **SKYDANCER**

DESIGNED BY: LARRY RENGER, PROJECT [redacted]

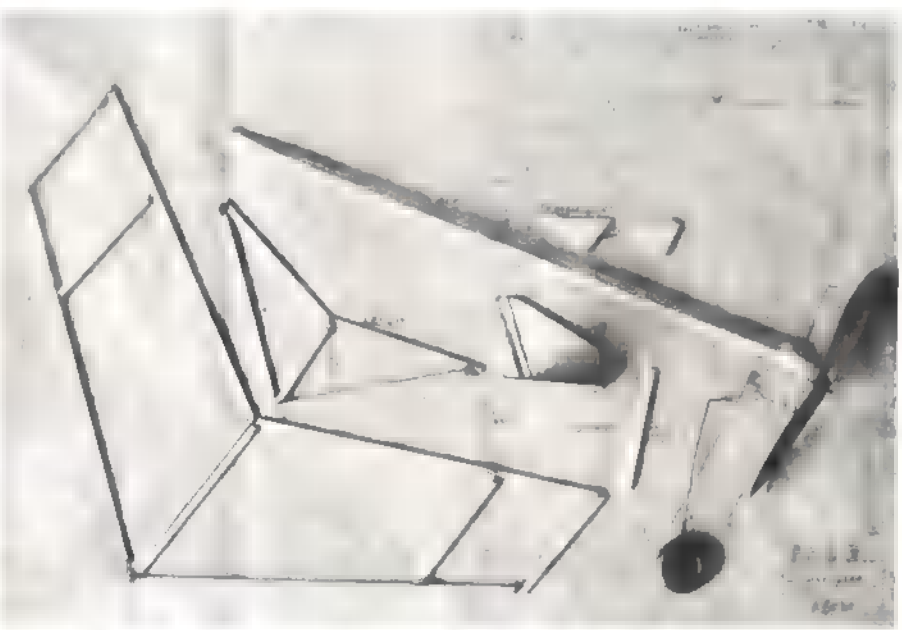
# POGO

Just because a beginner's model should be simple, build fast, and fly easily, does not mean it can't be stylish. Pogo is fun for all modelers.

FOR THE TENDERFOOT

**Aptly-named model climbs straight up, then flops into gentle glide when rubber unwinds. Ready-to-use plans on back of centerfold.**

**RICK RABE**



Note wing made on its covering material. Later the extra tissue is cut away, the wing turned over, and dihedral added. V-shaped rudders have built-on trim tabs.

AS THE PROPELLER picks up speed, the plane begins to move. In less than a foot, it is airborne and climbs almost vertically until the propeller stops turning. Instantly, the plane noses over and goes into a long gentle glide, finally touching down to a perfect landing.

Does that sound like the flight of some hard-to-build, expensive contest-type model? It isn't. It's just a normal flight of the Pogo.

The Pogo is not hard to build, nor is it expensive, or hard to fly. It requires a minimum of construction skills. An ideal beginners' project, the Pogo can be built in less than two hours and easily can be flown in the usual back yard. Wherever it is flown, its one-wheel landing gear, swept wing, and unusual tail arrangement will make it stand out from the ordinary beginner's plane.

### Construction

The tools for building this plane are those usually found around the house. When buying the required balsa, select only the straightest strips. Check by looking down the edge to see whether there are any bends in the strips. For help in selection, ask the hobby shop

sales clerk. For the propeller assembly and wheels, purchase [redacted] North Pacific plane kit such as the Skeeter which sells for about 15 cents.

Lay the plans on [redacted] building board and tape the corners down. Place the covering tissue over the plans, making sure it is wrinkle-free, and also tape its corners down. The plans can be seen through the tissue.

Cut out all balsa parts as shown on the plans, but not directly over them, else the covering tissue may be slit accidentally. Use several light strokes instead of one heavy one for cutting. Check each piece to be sure it is the proper size.

Lay the parts for the wing and the tail in their places. Fasten the parts to the tissue and to each other with a thin layer of glue. Do not use too much glue because it will make the plane too heavy. The tissue, in a later step, will be used as a covering material.

When inserting the tail fins, have the photograph handy for checking their angle. Place one of the fins on the building board, but not on the tissue. Apply a line of glue along the base edge of the fin. Lay the other fin on top of the one on the board [redacted] that the bases are lined up. Slide the fin angle guides between the two fins (one in the front and one in the back) [redacted] that the bases are still together. Looking at the fins from the front, they should now look like a slanted V. Allow all parts to dry completely.

If using the North Pacific landing gear, bend it to the shape shown on the plans. If building the gear from basic parts, cut a piece of wire and bend it as shown on the plans. To build the wheel, cut out six 1¼ [redacted] 1¼" balsa pieces from 1/32" sheet. Glue these pieces together, placing each one so that the grain runs opposite on each successive piece. When dry, sand to roundness and punch out the center with the landing gear wire. Attach the wheel and bend up the wire to keep the wheel on the wire. The parts are now ready to be assembled.

### Assembly

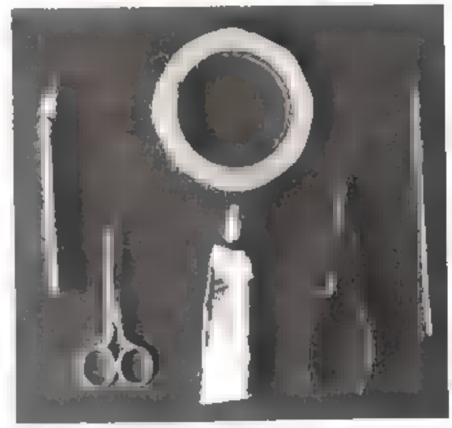
Cut the tissue from around the wing and tail, trimming off any excess. Cut out the fuselage and glue the tail in place. Allow to dry, then glue the fin assembly in place. Lay the wing, with the tissue face up, on the building board. Gently break the wing in the center and bend up [redacted] that the dihedral guide will support the wing tip. Glue the center section [redacted] that the wing will keep the angle.

When the wing [redacted] dry, remove the guide and glue the wing onto the fuselage at the location shown. When the entire assembly has dried, insert the pin to hold the rubber, using glue to hold the pin firmly. Wrap the landing gear with thread for extra strength and glue in place. Slide the propeller assembly onto the front of the plane and attach the rubber loop.

### Flying

Be sure the model balances as shown [redacted] the plan. Gently push the model forward at about shoulder height and release. It should glide straight forward and touch down about 12 to 15 ft. in front of you. Wind the propeller about 50 turns and launch the plane [redacted] in the test glide, releasing first the prop then the plane. The model should turn in flight and touch down about 20 ft. in front of you.

If the plane does not turn under power, bend the front part of the prop assembly. Try it again, this time winding it about 100 turns. The plane should climb gently to the right. If it stalls, bend the prop assembly a little more to the right. If it does not climb, straighten out the prop assembly a little by bending it gently to the left. For long flights [redacted] a drill with [redacted] wire hook in the end of it to wind the rubber. For ROG (rise off ground) flights, wind the motor about 400 turns and release the plane on the ground. This type of flight will demonstrate the reason for this plane being called Pogo.



Basic tools for model airplane construction. Knife must be sharp and thin for balsa.

## MATERIALS

3 strips of 1/8 [redacted] 1/16 x 36" balsa
1 strip of 1/8 x 3/8 [redacted] 36" sheet balsa
1 sheet of 1/32 x 2 [redacted] 36" sheet balsa
1 sheet of lightweight covering paper (Jap tissue works best)
1 piece of .030 wire at least 8 in. long (omit if using the North Pacific wheel)
1 North Pacific [redacted] assembly
16" of 1/8" flat rubber
Straight pin
1' button thread

## TOOLS

Single-edge razor blade or [redacted] knife
Needle-nose pliers
Ruler
Glue
Drill (with [redacted] wire bent to form [redacted] hook) [redacted] escapement winder
Masking Tape

Wind up the rubber band with a crank; hand drill is fine. Stretch rubber and pack in the turns to a full row of knots.

Flight from a takeoff is most fun. Release prop first, then model, and be sure to aim it into the wind. Po[redacted] hops into the air.

# Saga of the OQ-2A DRONE

Thousands of these small radio-controlled planes were built for the Armed Services by ■ California manufacturer.

JIM WHITE

Before Dee Bee and Lanier, there was a ready-to-fly radio-control model-plane factory!

Strut-supported wings have symmetrical airfoil so that they ■■ interchangeable, not aerobatic.

ON THE DRY LAKES of California's Mojave Desert, Northrop-Ventura (then known as Radioplane Company) began, in June 1941, prototype tests on ■ target drone with a twelve-foot wingspan. By 1945, the firm was producing forty of these small radio-controlled planes per day for the Armed Services.

Primarily, these drones were used to train antiaircraft ground defense units which were using sub-caliber automatic weapons up to and including 40 mm cannons. Flying at a top speed of 88 mph, the small radio-controlled drone had relatively the same size and speed characteristics at 200-yards range as did a normal-sized World War II fighter plane at 500 yards distance. The rugged little plane duplicated actual attack conditions and was easily maneuvered through practically all flight attitudes over any type of terrain.

Incorporated in the drone was a 24-foot parachute, which could be released either by the transmitter operator or automatically when hits were scored ■■ the airborne radio unit. This permitted salvage of the target and provided verification of the gunnery crew's markmanship. The target also could be, and often was, landed by remote control "dead stick" when sufficient landing area was available.

Although the target drone was designed, developed, and manufactured by Northrop-Ventura (Radioplane Co.), the Frankfort Sailplane Co. (Joliet, Ill.) also was awarded contracts to produce the bird for the armed services. Its radio transmitting equipment was manufactured for Northrop-Ventura by the Doolittle Radio Co. (Chicago, Ill.), the radio receiving equipment by Bendix Aviation (North Hollywood, Calif.), and the servo unit by Hansen Mfg. Co. (Princeton, Ind.). The catapult unit was supplied by Montpelier Mfg. Co. (Montpelier, O.).

The OQ-2A was catapult-launched, but it had landing gear which primarily served to cushion the shock of the drone's landing by parachute.

One of the most popular of the family of drones produced by Northrop Ventura was the OQ-2A (U.S. Navy Model TDD-1) radio-controlled target. The vehicle was powered by [redacted] two-cylinder air-cooled engine which developed 6 hp at 3800 rpm. The horizontally opposed engine [redacted] a two-cycle simultaneous firing type. Two concentrically shafted contrarotating propellers pushed the drone to a speed simulating that of actual fighter planes.

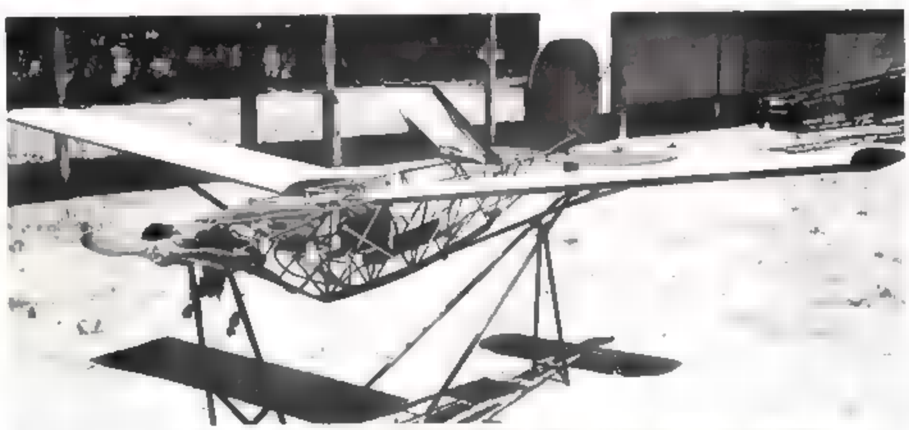
The engine incorporated a two-throw type crankcase supported [redacted] three bearings. The rear main bearing was [redacted] bronze sleeve. The forward main, a ball-bearing type, was of sufficient size to carry both radial loads and front propeller thrust. The extreme front end of the shaft was supported by [redacted] pair of ball bearings which were inside the aft propeller hub. The bearings, piston and cylinder walls were lubricated by mixing the lubrication oil with the fuel. The proportion was eight parts fuel to one part lube oil.

Engines were equipped with [redacted] centrifugally-operated spark advance mechanism, while earlier models had [redacted] manually-operated spark advance control timer.

The fuel system was operated by pressure developed in the engine crankcase. A small check valve furnished the [redacted] psi pressure required to operate the system and the pressure was transmitted from the crankcase to the fuel tank by a neoprene hose. Total fuel carried by the drone was 1.8 gal., which gave the bird a total of one hour's flight time.

The ignition system was [redacted] battery-coil-condenser type. An ignition battery of 6V was sufficient to start the engine and normally had [redacted] useful life of approximately one hour.

Spur gearing provided the counter-rotating drive for the rear propeller. The drive operated from [redacted] gear mounted [redacted] the crankshaft just forward of the front main bearing. This gear drove two counter-gears, the second of which meshed with the propeller drive gear mounted on the rear propeller hub. The hub was guided by the crankshaft on the inside and supported by a ball bearing on the outside. The front propeller was driven by the engine crankshaft. The gear train was lubricated with SAE 70 oil contained within the



Earlier versions had a single propeller and some thrust offset. Note equipment locations.

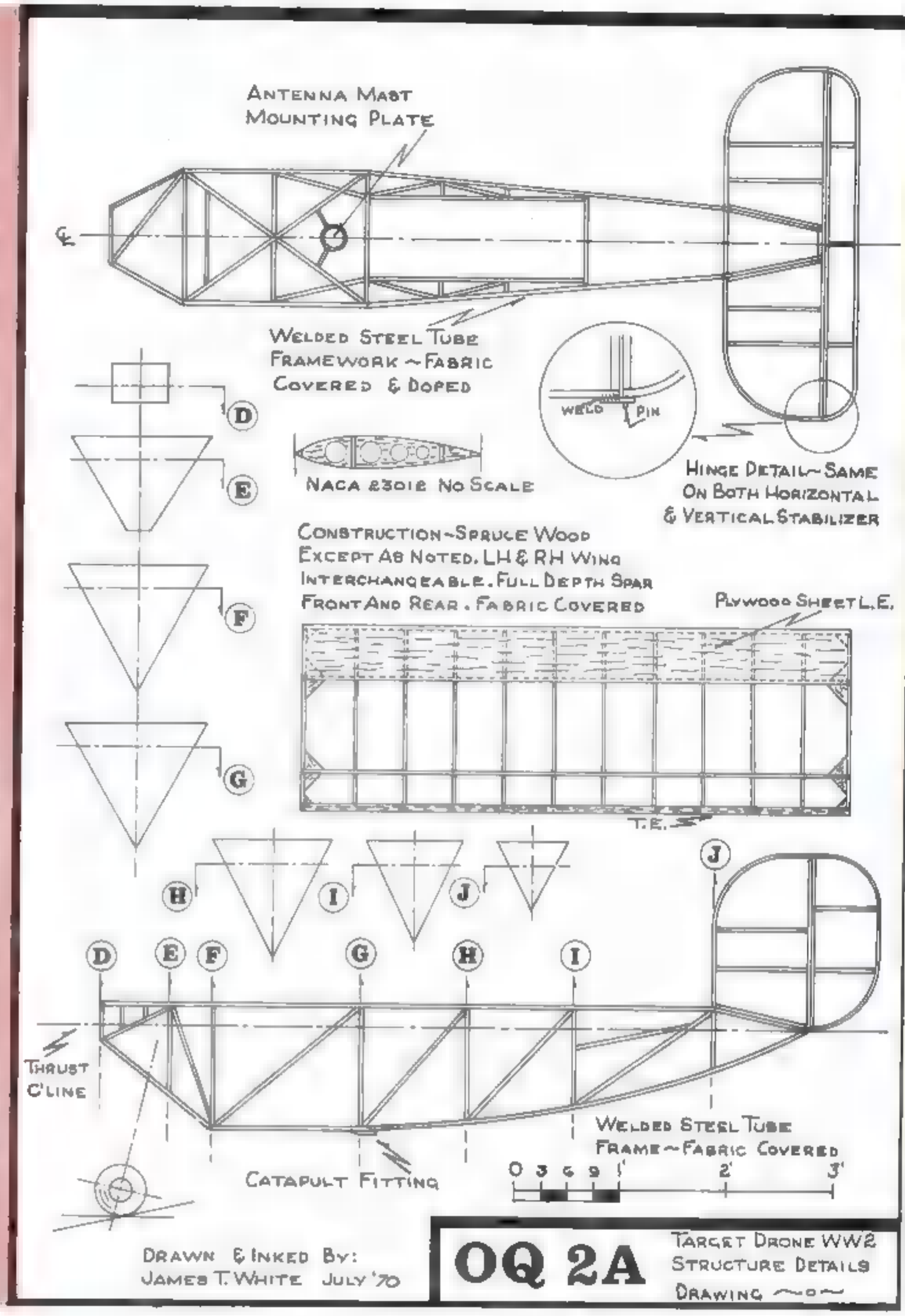
Simultaneous-firing 6-hp twin-cylinder engine drives spur-geared counter-rotating propellers.

## AIRFRAME SPECIFICATIONS

| | |
|---|---|
| Span | 146 11/16 in. |
| Overall length | 104⅜ in. |
| Overall height | 32 3/16 in. |
| Airfoil | NACA 23012 |
| Wing chord | 21 in. |
| Wing area | 19.24 sq. ft. |
| Wing loading | 6.12 lb. sq. ft. |
| Power loading | 16.6 lb./hp |
| Vertical stab. area | 1.5 sq. ft. |
| Rudder area | 0.90 sq. ft. |
| Horizontal stab. area | 3.0 sq. ft. |
| Elevator area | 1.12 sq. ft. |
| Dihedral | 7 degrees |
| Gross weight | 108 lb. |
| Engine | AAF Designation Type 0-15-1 |
| Fuel capacity | 1.8 U.S. gal. (1.5 British Imp. gal) |

## ENGINE SPECIFICATIONS

| | |
|---|---|
| AAF Designation | 0-15-1 |
| Type | Two-cycle, horizontally opposed, aircooled, simultaneous firing |
| Number of cylinders | 2 |
| Bore | 2¼ in. |
| Stroke | 2⅛ in. |
| Piston displacement | 16.9 cu. in. |
| Compression ratio | 6:1. |
| Valve arrangement | 2 ports per cylinder disk rotary intake |
| Average weight of engine | 26½ lb. |
| Rated horsepower | 6 |
| Rated rpm | 3800 |
| Fuel consumption | 1.6 gal./hr. |
| Breaker drive and ratio | Direct, 1:1 |
| Engine length overall | 16½ in. |
| Engine width overall | 19½ in. |
| Engine height overall | 11 in. |




gear housing.

The drone was launched by a 36-ft. catapult powered by a rubber shock-cord system. This method permitted operation from small restricted areas, which often resembled actual combat terrain.

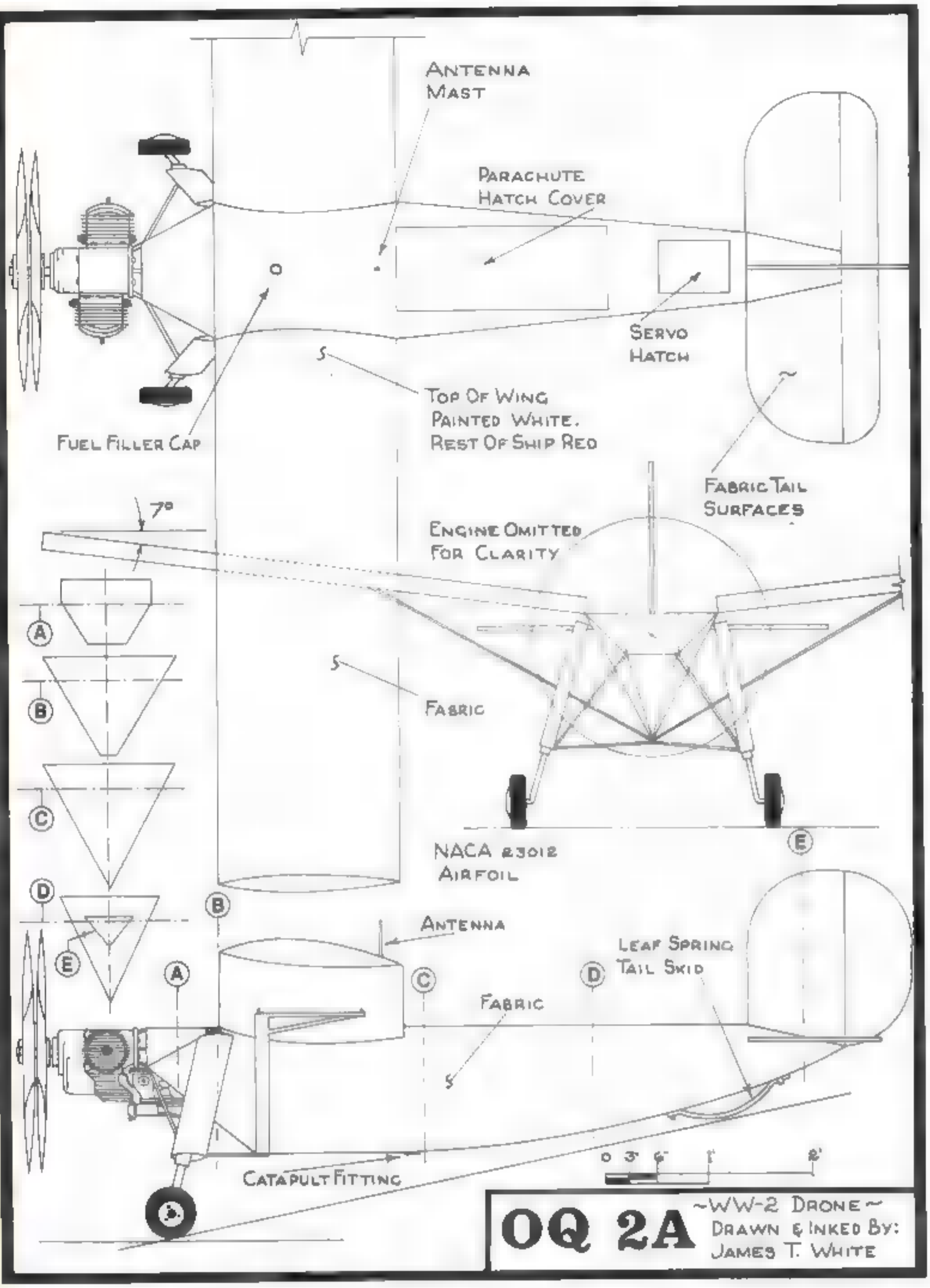
The fuselage was an extremely rugged structure of welded steel tubing, covered by doped muslin cloth fabric. The fuselage cross section was triangular. The larger of two openings along the fuselage top surface provided for the parachute installation; the rear hatch gave access to the servo control unit and stabilizer mounts.

Wing on the OQ-2A target were interchangeable and could be used for either right or left hand installation. Constructed of spruce, they were fabric-covered and used two full-depth spars, with the rib in three sections. Each wing contained twelve ribs. The end ones were solid; lightening holes in ten inside ribs made for a slight weight reduction. Thin plywood covered the top and bottom leading edges back to the front spar. The airfoil utilized was the NACA 23012 section. Each wing was supported by a single streamlined steel tubing strut. Trim adjustments were made by means of an adjusting screw where the strut attached to the wing's lower surface.

The fabric-covered tail surfaces also were fabricated of steel tubing framework. These surfaces were flat, since no airfoil section was required for good flight characteristics. Horizontal and vertical stabilizers were identical and interchangeable. Conventional elevator and rudder, in keeping with the manufacturer's design and fabrication methods, were the only means used to control the target in flight.

Landing gear of the conventional three-point type had two front shock-mounted landing wheels and a leaf-spring tail skid. Two tubular front landing struts were provided with rubber shock cord to withstand landing impact. The shock travel was five inches in the strut, plus approximately two inches in tire deflation. (In the photos, the display model has had the shock cord removed from the landing gear struts, thereby giving the drone a somewhat squat appearance.)

The target's basic system of radio-control was an ultrahigh frequency carrier of 73 megacycles modulated by




five different audio frequencies. Four of the audio frequency tones were used for the drone's four flight attitudes: right, left, up, and down. The fifth frequency was used to release the parachute, which in turn operated a manual shutoff system for the engine. The fifth frequency was operated by a button-type switch, whereas the other four frequencies utilized a control stick to simulate normal aircraft control.

Incoming signals were received by a twelve-inch antenna mast, located just forward of the wing trailing edge on top of the fuselage. The radio receiver had a super-regenerative type detector preceded by a tuned RF stage. The audio output of the receiver was applied to five individual audio channels, each consisting of a band-pass filter, relay tube and relay. (Like a RC reed system.)

Power for the radio was provided by the battery box unit mounted in a channel-type tray in the fuselage. The unit could be shifted both fore and aft, thereby balancing the ship for proper flight attitude.

The servo unit was activated by the receiver, thus providing mechanical action necessary to control the rudder and elevator. Two 6V motors with reversible fields provided action to the gear trains which gave the leverage required for flight control. A single package servo unit was located just forward of the horizontal stabilizer and was accessible through the fuselage top.

The 24-foot circular canopy parachute was of standard design. The recovery system also was provided with a standard-type pilot parachute. A single cable extended from a D ring and was attached by a shackle to an apex of four riser cables, which in turn were fastened to four points on top of the fuselage.

The entire target drone was fabric-covered with 80-thread muslin cloth and was dope treated in two colors. The top of the wings was white, the rest of the shipe was red. This two-color combination provided a visible means of telling the difference between the top and bottom of the plane during flight. An interesting fabrication sidelight: the wing fabric covering was manufactured as a sock, which was later slipped onto the wing structure and doped.

Much of the testing of the drone was done on the dry lakes of the Mojave Desert. A stripped-down Packard automobile sometimes was used as a test platform. The test plane was mounted on a steel platform structure added to the auto's front section. As the auto approached the drone's flight speed, the designers could observe the target's flight characteristics without fear of actual flight damage.

In operation, the drones were flown by men from various branches of the services. They were trained by and under the sponsorship of Northrop-Ventura. This policy of training Armed Services personnel to fly the various drones was continued late into the 1950's and early 1960's.

Such were some of the early stages in the beginning of radio-controlled flight. Of the thousands of OQ-2A drones fabricated, only one is now known to exist and that one is carefully preserved by the Northrop Corporation.

The OQ-2A drone was phased out near the end of World War II. Northrop-Ventura's early pioneering with pilotless drones help the firm to develop and produce later birds in vast quantities—notably the OQ-19 and KD2R5 drones.

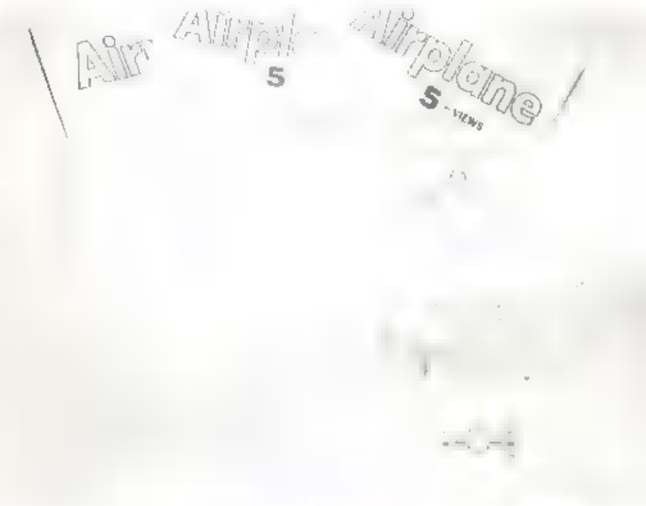
*Author's Note:* "As with many old-line airplane firms, Northrop-Ventura's past is often clouded with this, that, and other things. One thing the firm never did care to discuss was the fact that Radioplane was originally founded by Reginald Denny, the old-time movie actor and long-time modeler. Once the firm began to move along, his activity with Radioplane became less and less.

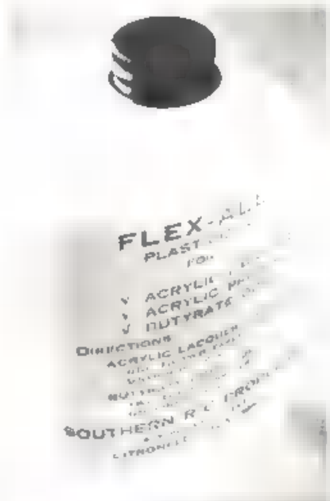
"In the 1950's, radio equipment was supplied to Radioplane by Babock Engineering, but Babcock was sort of a spring-off from the main firm. It was headed up by the late Ferris Smith, who also was a Vice Pesident of Engineering at Radioplane. The same type of thing occurred with the servo units and other equipment too. It became very involved and difficult to understand. The president of Radioplane, the late Whitney Collins, became the President of Northrop Corporation when Northrop bought out Radioplane. The name of the company was then changed to Northrop-Ventura.

"I also believe that Mr. Fox (Fox Mfg. Co., Fort Smith, Ark.) was with the company during its early days, but I wouldn't swear to it.

"I do know Marilyn Monroe (the late actress) worked in the wing section during the war. Her career began with some still photos taken while she was employed by Radioplane.

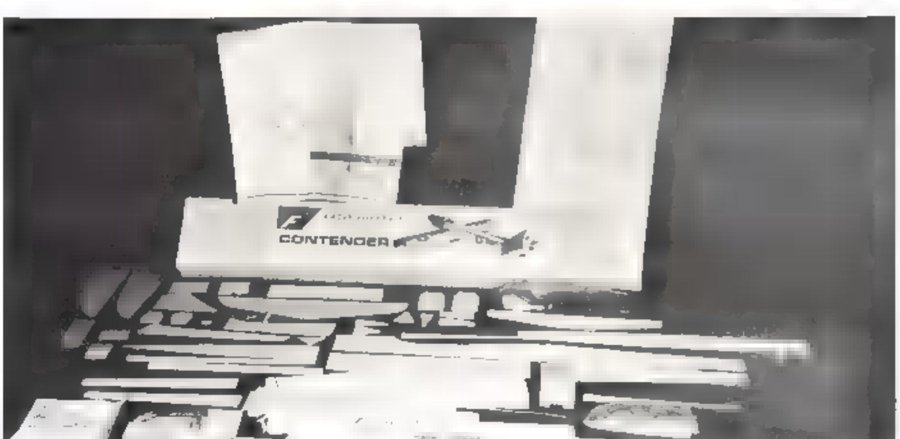
"One strange last fact, I went to junior high school with Marilyn Monroe, class of 1939. Now I skipper a West Coast commercial tuna vessel." *Jim White*




# NEW PRODUCTS CHECK LIST

Write the manufacturers for more data; tell them, "I saw it in American Aircraft Modeler."



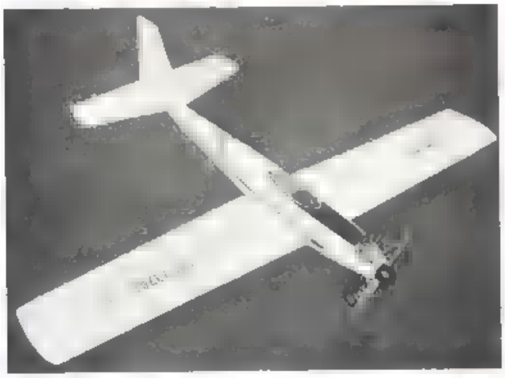

**Dynamic Models/Porsche 917 coupe.** Quality throughout, kit features centrifugal clutch, live rear axle, sponge tires, rugged construction, detailed instructions. $59.95. Clear body supplied, ⅛ scale. **Dynamic Models**, 13309 Saticoy St., N. Hollywood, Calif. 91605

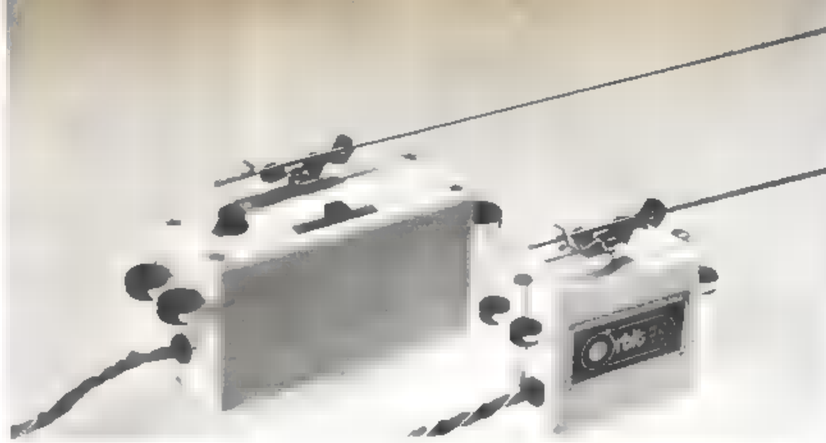
**Dave Bloom/Custom paint job.** Custom painting of clear plastic body of Dynamic's Porsche. Using own paint formula, Dave shadow-sprays body from inside, providing unmatched beauty, realism, and resistance to scratches. Up to $29, depending on body style and size. Write for details to Dave Bloom, 3211 S. 52nd Court, Cicero, Ill. 60650

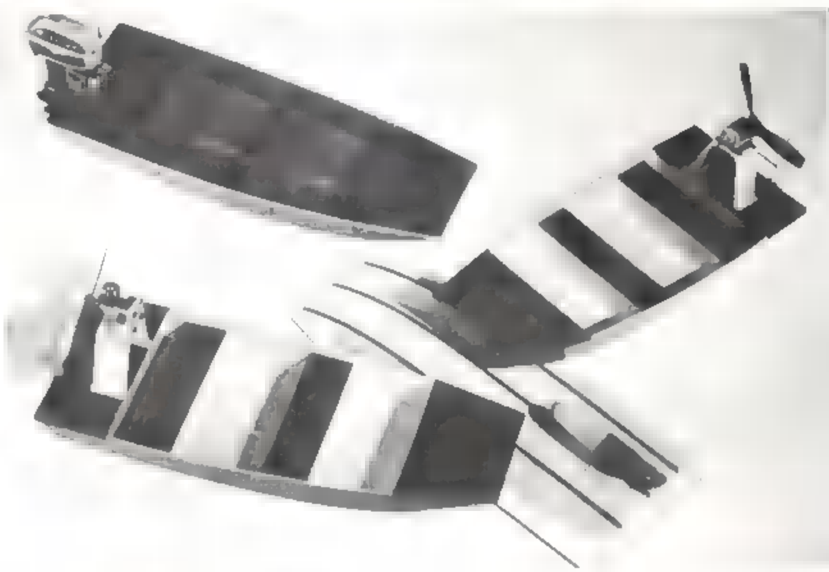
**Bernhard Klein/Airplane 5-Views.** Issued periodically, 5-Views is a natural for scale modelers and air historians. Each issue contains accurate, detailed drawings of several well-known, rare, or experimental aircraft. 5-Views shows detail often hidden in typical 3-view treatment. Six copies, $4.50, 80c ea. **Bernhard Klein**, 76 Highland Ave., Midland Park, N.J. 07432

**Southern R/C Products/Painting aid.** Flex-All Plasticizer can be mixed with acrylics or butyrate dopes to provide more flexible finish less likely to crack or chip. One or two teaspoons treats a pint of unthinned dope. **Southern R/C Products**, 527 Pecan St., Citronelle, Ala. 36522

**Canyon Plastics/Schweizer 1-26.** Easy to assemble, 6'6"-span sailplane features preformed polystyrene construction throughout. Aluminum tubing molded in fuselage provides conduits for pushrods. Plug-in wing spars provide extra rigidity and safety. Extra cowling canopy for power pod flying [illegible] 09 engine. $29.95. **Canyon Plastics**, 1014 Travis, Amarillo, Tex. 79101







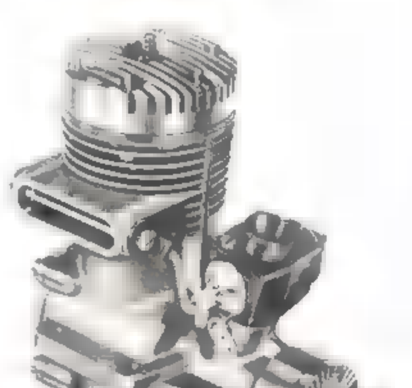
**Top Flite/Contender.** Eight-hour work time from balsa built-up fuselage to covering stage. Easy to handle but performs aerobatics beautifully. 29 to 60 recommended power, 54" span. With hardware, $34.95. **Top Flite Models,** Inc., 2635 S. Wabash Ave., Chicago, Ill. 60616

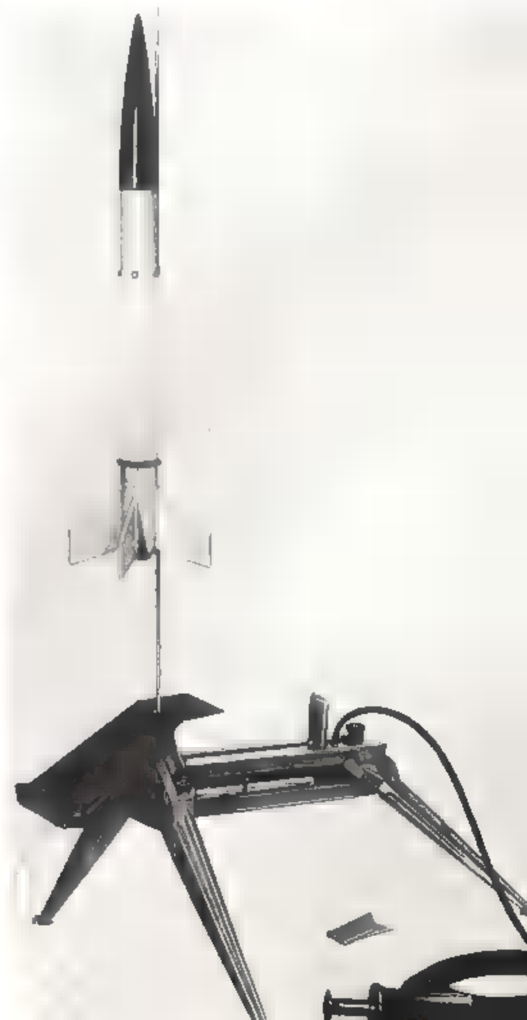
**Top Flite/MonoKote.** Not supplied with the above kit but ideal for covering the plane, MonoKote is the fastest and least expensive finishing process. Opaque MonoKote costs $1.35 per running ft.—10 ft. needed for the **Contender. Top Flite Models,** Inc., 2635 S. Wabash Avenue, Chicago, Ill. 60616

**Dumas/Little Jon.** Beginner's dreamboat, only 15" long, 6" wide. Runs on Pee-Wee 020 engine with standard prop, electric outboard or engine-prop combination. For small lakes, puddles, etc. All mahogany and birch construction. $2.95. **Dumas Boats,** Box 6093, Tucson, Ariz. 85716

**Dumas/Throttle override.** For RC applications, override extends battery and servo life by not having servo operating in stalled condition. Can also be used to check throttle without turning [redacted] transmitter. For push-pull or rotary output. 59¢. **Dumas Planes,** Box 6093, Tuscon, Ariz. 85716

**Jetline Products/Big Bippy.** Does all AMA and FAI maneuvers with [redacted] on 56 to 60 engines. 62" span, 51½" length. Deluxe kit features matched fuselage sides, band-sawed, satin-finished wood parts, complete plans and instruction book. Contest-proven performance for $49.95. **Jetline Products,** Box 22, Bellevue, Tenn. 37021

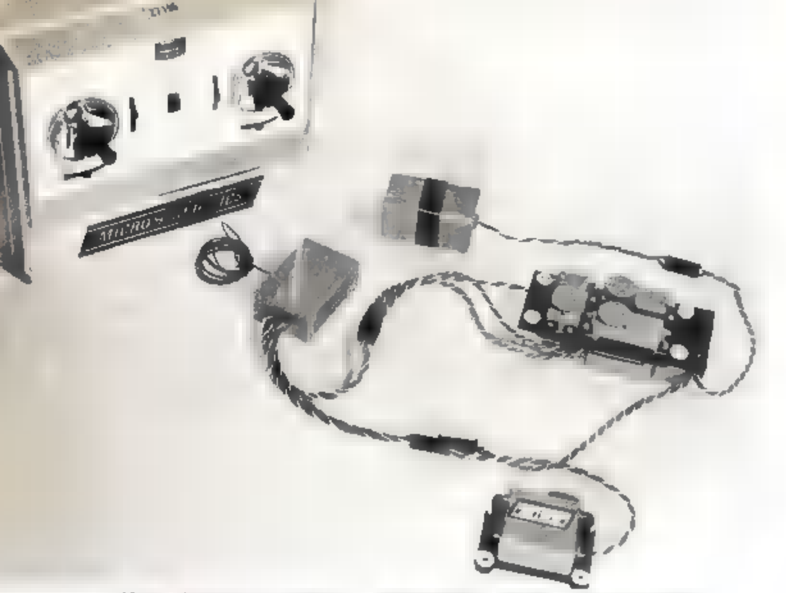




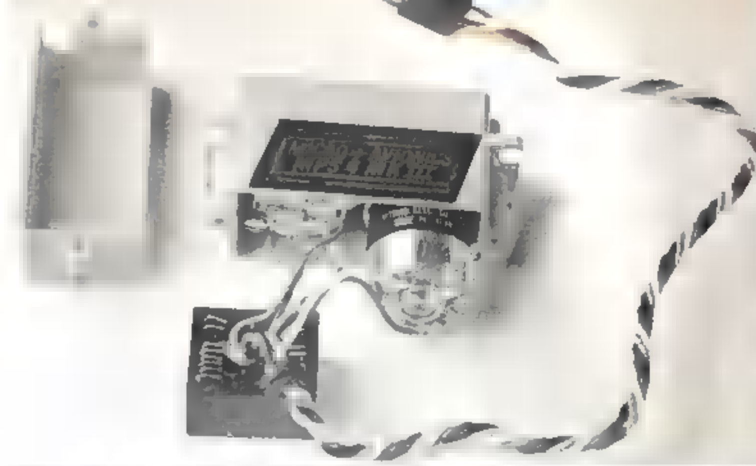
**K [redacted] Mfg. Corp./Veco 61RC engine.** Series 71 engine features redesigned crankshaft, crankcase, piston, head for smoother idle, greater horsepower. Took 1st, 2nd, 5th in Pattern D at '70 Nats. $65. **K [redacted] Mfg. Corp.,** 12152 Woodruff Ave., Downey, Calif. 90241

**Octura Models/Stack extension.** For 60 to 71 engines. 2½" long, 1.6 oz. Extractor type design assists in scavenging exhaust over wide rpm range. Can be ordered for mounting 90 or 80 degrees from cylinder bore. Available for **Supertigre 65 ABC, Rossi 60.** Other units for 60-plus and 40 engines in works. **Octura Models,** Box 536, Park Ridge, Ill. 60068

**Centuri Engineering/Servo Launcher.** Features air-actuated launching technique which eliminates cables and heavy-duty power. Two photo-flash batteries provide power for many launchings. For all single engine rockets. Folds for storage. $5.50. **Centuri Engineering Co.,** Box 1988, Phoenix, Ariz. 85001



Most distinctive feature is lightweight plastic case transmitter.



New Orbit systems use [redacted] integrated circuit amplifier in the servos. It can be special-ordered for the Micro systems. Because it is unique in the RC hobby, we are reviewing it and comparing it with the discrete Micro-Avionics amplifier. Performance is virtually identical, but the IC brick is more vibration-proof. Unit is [redacted] epoxy brick; actual IC is much, much smaller.

# Micro-Avionics 4-channel and the MPS-4 IC servo

**FRED MARKS**

MICRO-AVIONICS entered the digital field in 1966, under the guidance of Don Mathes and as [redacted] subsidiary of Orbit. Prior to this the company was known for its "Green Box." In May 1969, Micro-Avionics and Orbit were acquired by Datatron and their systems became part of its line. All engineering, development and production are carried on under the same roof, and the Orbit-Micro team recently moved to [redacted] new facility in Garden Grove, Fountain Valley, Calif., not far from Los Angeles.

While the Micro-Avionics system shares many design features with the Orbit systems, this Molded Micro, as it is known, does not have all the accessory elements found [redacted] the Orbit. For example, there is no buddy-box arrangement and the IC servo is not standard on the set. However, there [redacted] no quality differences between the sets, since the receivers and the discrete component servo amplifiers are identical.

The Micro-Avionics system reviewed is a two-stick, four-channel system comprised of the transmitter, receiver, four standard PS-4D servos, 500 mah nickel-cadmium battery packs, [redacted] complete set of servo mounting trays and hardware, and the charging harness. In addition, four PS-4D servos equipped with the new integrated circuit servo amplifier were obtained and tested. Although they are not standard with the system, we felt this signficant change in technology would be of general interest.

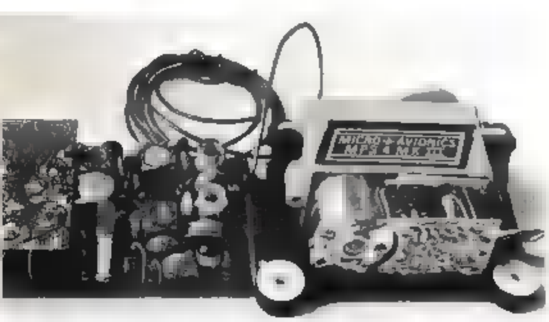
The transmitter case is [redacted] definite design departure. It has an all-plastic case, which divides in half, and is held together with one large quick-detach screw. Light and comfortably styled, the unit tested was cream in color, with a nice-looking aluminum bezel on the face. Sticks are standard Orbit with electromechanical trim which produces the much-appreciated very broad trim adjustment. A single charger receptable accepts 110VAC and distributes charging current to the airborne pack. The commonly-used dropping resistor and diode rectifier provides approximately 45 ma to the transmitter and airborne packs simultaneously. Warning: Do not remove the transmitter back when charging and never activate the charger when in bare or stockinged feet on a damp basement floor. Charging is indicated by the usual "angry red eye."

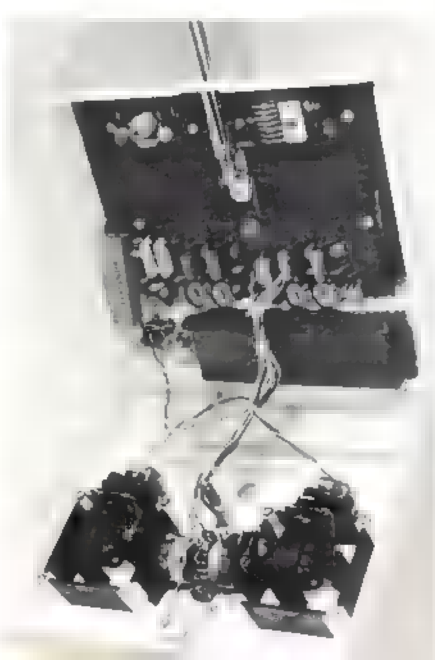
An RF meter is located near the top of the transmitter face. Electronically, the transmitter differs from the Orbit, primarily in the RF section. However, results are precisely the same. Pulse repetition rate is set at around 30 per

*(Continued on page 82)*

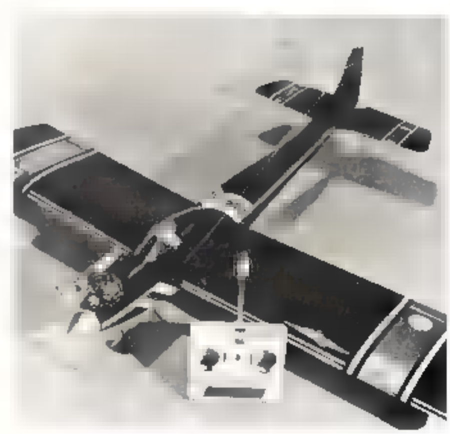
Considerable R [redacted] D effort was put into making the plastic-cased transmitter legal and still quite powerful. Note the stick units are partially built into the case.

Receiver package is conventional four-channel Orbit type used throughout the Datatron line. Standard discrete component amplifier servo on right.

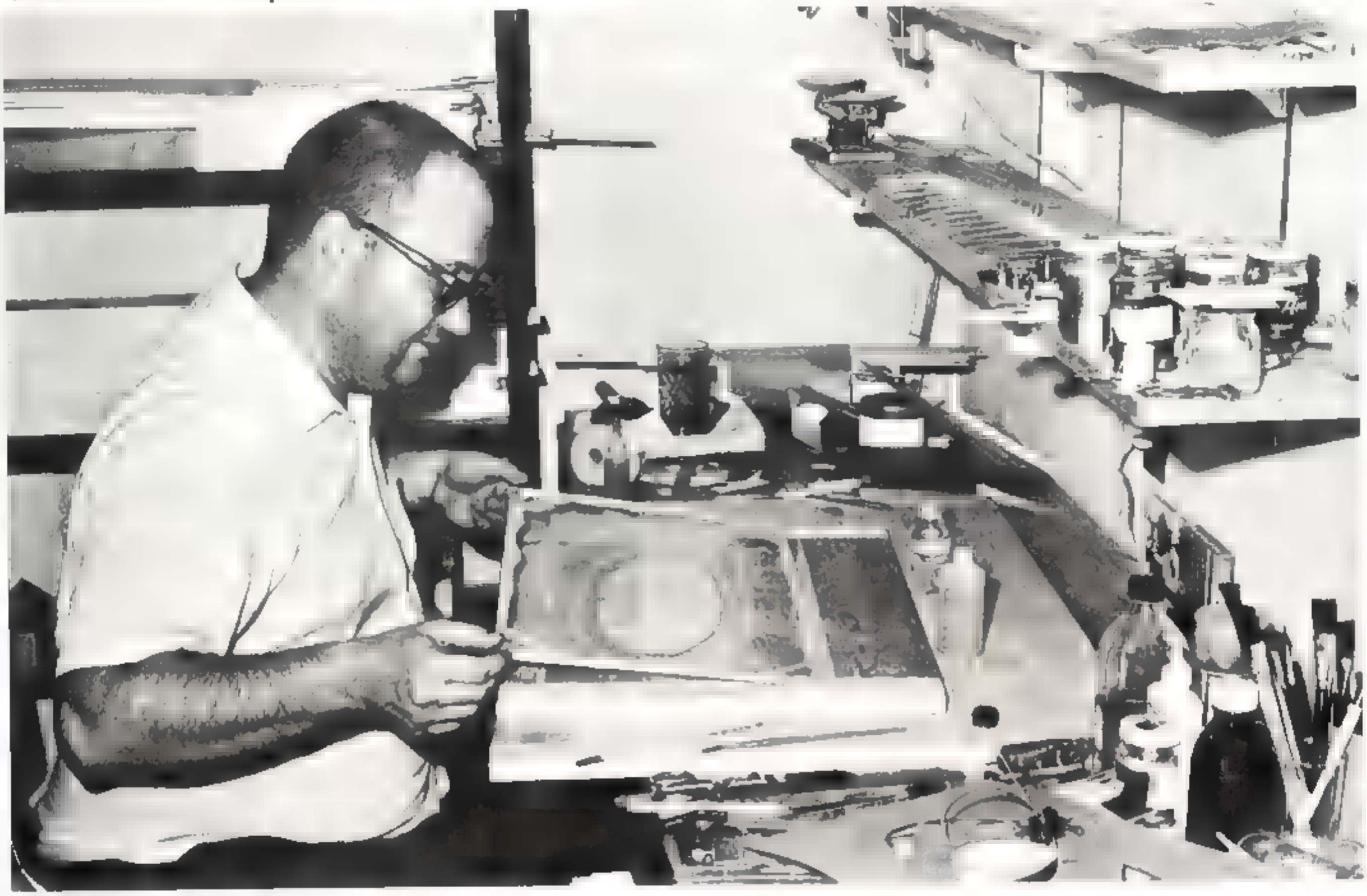




Sterling's [redacted] Lancer was the flight test vehicle for this review. A well-mannered, advanced trainer ship, convenient to transport and [redacted] great Sunday stunter.



Conclusion of three-part series



# Bilgri Patching and Covering Methods

By the grapevine, author learned these two elements for serious microfilm modeling.

TOM VALLEE

THE BILGRI SYSTEM of microfilm covering is more suitable for lighter, [redacted] advanced models, such [redacted] FAI (world championship) class indoor models. This system was first described in print by Joe Bilgri in [redacted] famous series of indoor articles in 1960 and now deserves repetition. Patching techniques will also be covered because it is virtually impossible to keep [redacted] indoor model flying very long without them.

As the first step in the Bilgri method, take the building template for the wing or stab to be covered and trace its outline in pencil on a building board or workbench top.

Place the wing (or stab) on the penciled outline. Then wet the surface of the building board for the width of an inch just outside the outline. Also wet the top of the wing spars and compression ribs, using a soft brush dipped in tap water. Be careful to get as little water as possible inside the wing spars.

Next take a frame of slack microfilm (several inches longer and wider than the part to be covered) and lay it film side down over the wet wing (or stab, etc.). Blow gently on the film as it settles down over the wet framework, [redacted] that the covering adheres nicely to the wing outline. Use [redacted] finger to pat down the film on the [redacted] or two spots where it has not adhered.

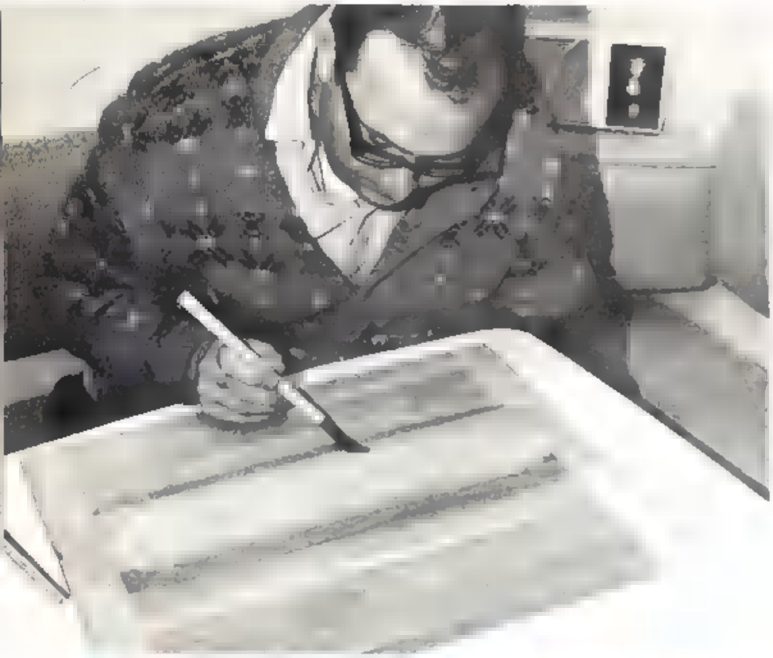
A few minutes later, when the wet wing has partly dried, cut the film along the outside of the wing spars with a hot wire or a brush dipped in acetone. If using the latter, the brush must be "dry," with just enough acetone on it to cut the film on the outside of the still wet wing spar, but not enough to dissolve the wing covering. Most modelers will find a hot wire easier to use.

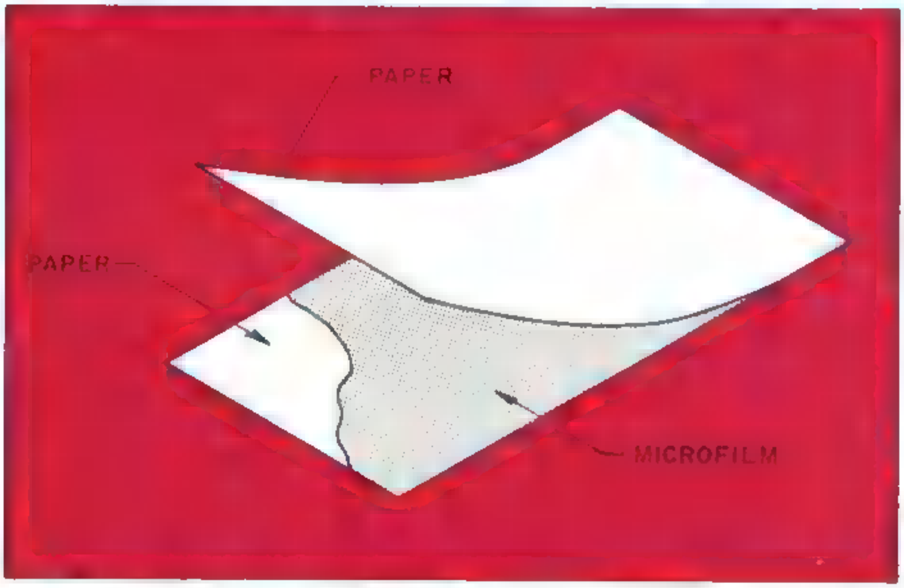
At this point, the wing tends to stick to the board or bench top. To free it, carefully and slowly slide [redacted] razor blade between the bottom of the wing spars and the building board.

Indoor wings are covered flat and dihedral added after covering. Hold the wing down with small weights, crack the wing spars with a sharp blade at the dihedral break and carefully block up the wing tips. Apply small drops of glue at the dihedral joints and the wing is ready for mounting and bracing.

Microfilm is fragile and few indoor builders finish construction without poking at least one or two holes in the covering. Does this ruin the model? Certainly not! Holes [redacted] quickly mended with squares of microfilm patching material and the plane is ready to fly!

Making patching material is easy. Lay [redacted] frame of microfilm, film side down, [redacted] sheet of Japanese tissue. Lay a second sheet of tissue over the film. Cut around the inside of the frame with a sharp blade and carefully lift the frame and excess tissue free. The result is a sheet of microfilm patching material, [redacted] sandwich of microfilm between two sheets of paper. From this, patches of any reasonable shape and size easily can be cut






Microfilm patching material is ■ easily prepared sandwich of microfilm between two sheets of paper (Japanese tissue is best). Use ■ pair of scissors to cut individual patches to proper size. Open the 'sandwich'. The microfilm will stick to one of the pieces of paper. The patch is now ready to be applied to your model. See photos.

with ■ pair of scissors.

To repair ■ hole in the wing, simply cut ■ patch of the right size and remove one piece of tissue. The microfilm will stick to the other piece of tissue. This ■ the patch proper—a piece of film backed by paper.

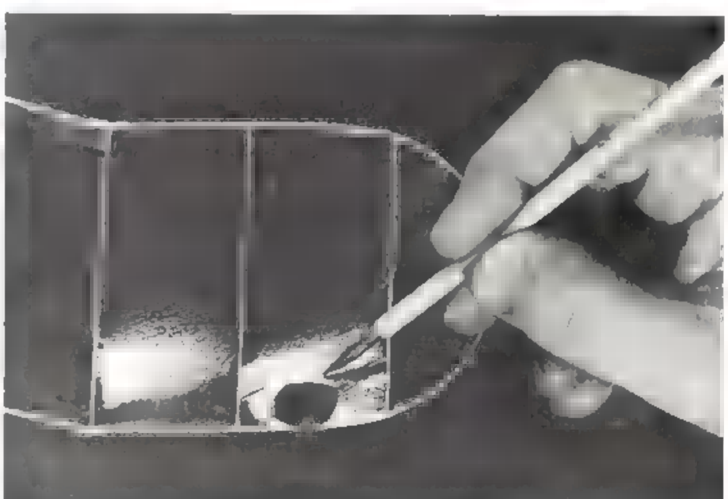
Using a soft brush, apply a few droplets of water to the film around the edges of the hole. Carefully place the patch, film side down, over the hole. Then press the patch between two fingers, not from one side only, against the wing. Remove the backing tissue with the aid of a moistened finger tip. Smooth down any loose edges with a water brush and the model is ready to fly. In case of a jagged irregular hole, the procedure is same, except droplets of water ■ applied to film side of the patch to avoid spreading the tear in the wing film.

This business of being able to patch indoor models is most important be-

Left: Patching starts by wetting the film around the hole lightly with water.

Center: The patch is put over the hole and attached by touching it between two fingers.

Right: Lift off paper gently. Smooth out the wrinkles with water. Remove excess film.



Left: First step in Bilgri method is wetting board one inch beyond the wing structure.

Center: Lay film over wing, then blow on it so it adheres completely to structure.

Right: After partial drying, cut excess film away with hot wire or acetone-dipped brush.

cause, quite often, an indoor beginner will come to a contest with his first serious indoor model, damage the film and give up, assuming his model is ruined. Yet, after some simple field repairs, the models could be back in the air in a few minutes! Witness my own experience as a beginner.

About five years ago, when I first began serious indoor modeling, I showed Bill Bigge a picture of Joe Bilgri holding what looked to be a completely demolished indoor model with a folded-up wing whose spars were broken in several places.

Imagine my amazement when Bill said Joe Bilgri's "demolished" model probably was flying good as new within an hour after the photo was taken. Bill's reasoning was as follows: Since Joe covered his models with dry (non-sticky) microfilm, it would be a simple task to unfold the wing, which would be held in place by the brace wires. Then a few drops of glue applied to the broken spars would leave the wing strong as ever.

Bill went on to say that it would be a simple task to mend any torn spots with mircofilm patches. At that point, the model would be ready to fly and perhaps even win the contest!

I was elated at having this information! After considerable effort, I had just finished my first serious indoor model, only to poke a big hole in the microfilm near the middle of the wing. I thought the model was ruined and that the wing would need to be dismantled, recovered, and braced again, a considerable project for a beginner.

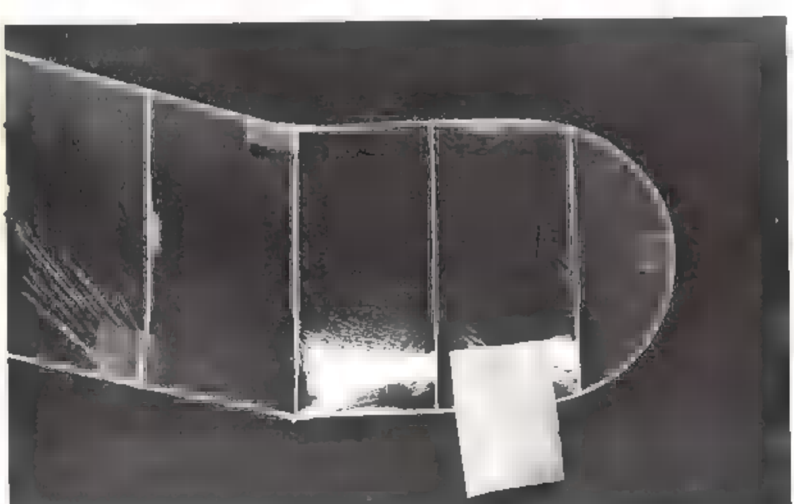
After a little instruction from Bill, the wing was soon mended. Shortly after this, proudly wearing its patch, that model was flown to a win in my first indoor meet, thanks to Bill's help. Now, when going to a contest or flying session, I always take along a sheet of microfilm patch material for field repairs. Any minor damage to my models can be remedied as it occurs.

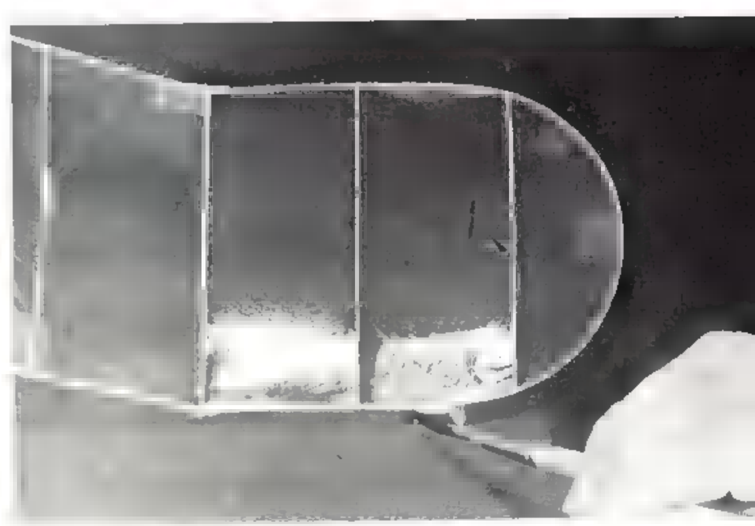
My favorite model, at present, is the Snark FAI. It is two years old and still covered with the original film. It has participated in over sixty full-bore contest flights at seven different meets and has set several low-ceiling national records. The wing may be full of patches, but the model still flies fine.

Many outdoor modelers certainly don't get this much use out of their ships so, if it's possible to get this many flights out of a lightweight indoor model, perhaps these flyweight ships are much easier to build and handle than most people realize.

Certainly building good indoor models is within the ability of any serious free flight modeler. Two previous parts in this series (Jan., Feb. 1971 AAM) have covered other necessary techniques. The first article included full-size plans and building information for a small indoor model, the Bandersnap, suitable for the smaller flying sites where most indoor modelers do their first serious indoor flying.

The second article covered techniques for making frames of microfilm and a simplified system for covering indoor models with microfilm. Dubbed "The Quick and Easy System," this method is easy to master and particularly suited for covering heavy beginners' models.





A speed pilot's dream come true, the Northrop Gamma shone as a military craft, a scientific instrument, sport job deluxe, and even as a mail and passenger carrier.


Equally at home on floats, skiis or wheels, this Northrop Gamma carried explorer Lincoln Ellsworth into previously untouched Antarctic regions.

# the plane that had it all

DC-8's, 707's and 747's skim the top of the atmosphere in comfort, thanks to the work of Tommy Tomlinson and this Gamma Model 2D.

## DON BERLINER

This modified Gamma Model 2E was the prototype of the bomber version supplied in quantity to the Chinese to use against the invading Japanese in the years just before World War II.

THERE ARE MILITARY airplanes, and commercial airplanes, and scientific airplanes, and sport airplanes. And there is at least one airplane which earned its place in the sun by being all these things and by looking so great that it could easily have attracted the world's attention by just sitting on the ramp, motionless. The Northrop Gamma was that plane.

It began as a speed pilot's dream come true; eventually it led to an Army bomber and to fast, comfortable, high altitude passenger travel. Along the way, it pioneered flight in the Antarctic and set a fistful of transcontinental speed records. To do all this, it had to combine what were then the latest technical ideas with such radical concepts as wind-tunnel-designed wing fillets and large split flaps.

The beginning was February, 1932, when Frank Hawks decided his Travel-Air Mystery Texaco 13 wasn't fast enough and asked the manufacturers to come up with something better. It was to be financed by his employers, Texaco. Famed designer John K. Northrop played the major role in planning, and it was his brainchild that the Northrop subsidiary of Douglas set to work on. Designing began in May, 1932, and the first Gamma, named Sky Chief, was test flown on Dec. 3, 1932.

It was long and it was sleek and it was metal from cowl to tail cone. The elaborate wing-fuselage fillets eliminated all the troublesome interference problems encountered by other low-wing airplanes and actually reduced the total drag. It was possible to place the wing completely under the fuselage, which allowed for much greater space inside. Older planes had been forced to clutter up their cargo space with bulky wing spars, but now there was plenty of room for freight or passengers on planes like the Gamma or, later, the DC-3.

But what really counted was how quickly you could get from where you were to where you wanted to be. Frank Hawks showed how fast his big silver bird could do its job by flying from Los Angeles to New York (no simple trick in those days) at an average speed of 180 mph for the 2450 miles. Power for NR-12265 was a 14-cylinder Wright R-1510 Whirlwind, rated at 700 hp at sea level. The fame achieved in this and other speed runs was just what Texaco wanted, being worth far more than the plane's original purchase price of only $40,000.

The Sky Chief was flown by Hawks for more than a year, then sold to boat builder/racer Gar Wood in 1934. An accident during the 1936 Bendix Trophy Race from New York to Los Angeles finally destroyed the ship when it exploded in flight and sent pilot Joe Jacobson home in a parachute.

By any standards, the Gamma was ■ success, so nothing could be more logical than to build more. The second Gamma (Model 2B) went to Arctic explorer Lincoln Ellsworth in 1934. He and pilot Bert Balchen tried flying it to uncharted regions of the Antarctic that year. However, the plane was damaged when it became stuck in the ice and had to be returned home. Finally, on Nov. 23, 1935, Ellsworth and Canadian pilot Herbert Hollick-Kenyon took off from an island in the Weddell Sea and headed for Admiral Byrd's pioneering base at Little America. Their trip became one of the classics of exploration, as fierce weather, aggravated by radio failure, forced them to land repeatedly, finally making it to within 25 miles of their goal and then finishing the trip with ■ six-day sled ride.

Even without television, the world quickly became aware of such exploits, and the Gamma was very much in the spotlight. The third one built (2C) was a basic Gamma, but with enough modifications to make it ■ attack bomber for the U.S. Army. Designated the YA-13, it was powered by a Wright R-1820 Cyclone engine which gave it an estimated top speed of 207 mph. The YA-13 never got very far, ■ the single prototype ■ converted into the XA-16 in 1935, with a new Pratt ■ Whitney R-1830 Twin Wasp as power. The XA-16 remained one of a kind, too, although it led directly to the Northrop A-17, of which more than 200 were built in 1935-37. It ■ one of the most widely used U.S. military planes of the pre-World War II period.

The Gamma Model 2D certainly was one of the most significant airplanes of its day and directly influenced the millions who travel high and fast and relaxed ■ DC-8's and 747's. Once owned by TWA President Jack Frye who used it ■ ■ personal transport, this Gamma was turned into a flying laboratory for research into the conditions of sustained high altitude flight.

Pilot D. W. "Tommy" Tomlinson and NX-13758 spent many hours cruising above 30,000 feet and discovered what is generally accepted today: that most of the bad weather is below. Smooth, efficient flying results when the ship goes upstairs and there is ■ substantial increase in true air speed as a properly-equipped airplane gets up into thinner air. From the Gamma, TWA then moved to ■ instrumented Douglas DC-1 and thence to the Boeing Stratoliner, the first pressurized airliner.

With its long-range speed capabilities ■ readily apparent, it was not surprising that such speed enthusiasts as Jackie Cochran wanted the Gamma. Hers was something different, being powered by a 700 hp Curtiss Conqueror liquid-cooled V-12 tucked into a slim cowl. It was her plan to fly it in the MacRobertson Race from England to Australia in 1934, but the airplane was badly damaged on its delivery flight. The Model 2G was rebuilt with ■ Pratt & Whitney Twin Wasp in the nose. Jackie started the 1935 Bendix Race in it but dropped out early because of severe weather.

Howard Hughes then took over Cochran's NR-13761 and proceeded to blast speed records in all directions: Los Angeles to New York in January, 1936, at 255 mph; Miami to New York in April, 1936, at 250 mph; Chicago to Los Angeles in May, 1936, at 215 mph.

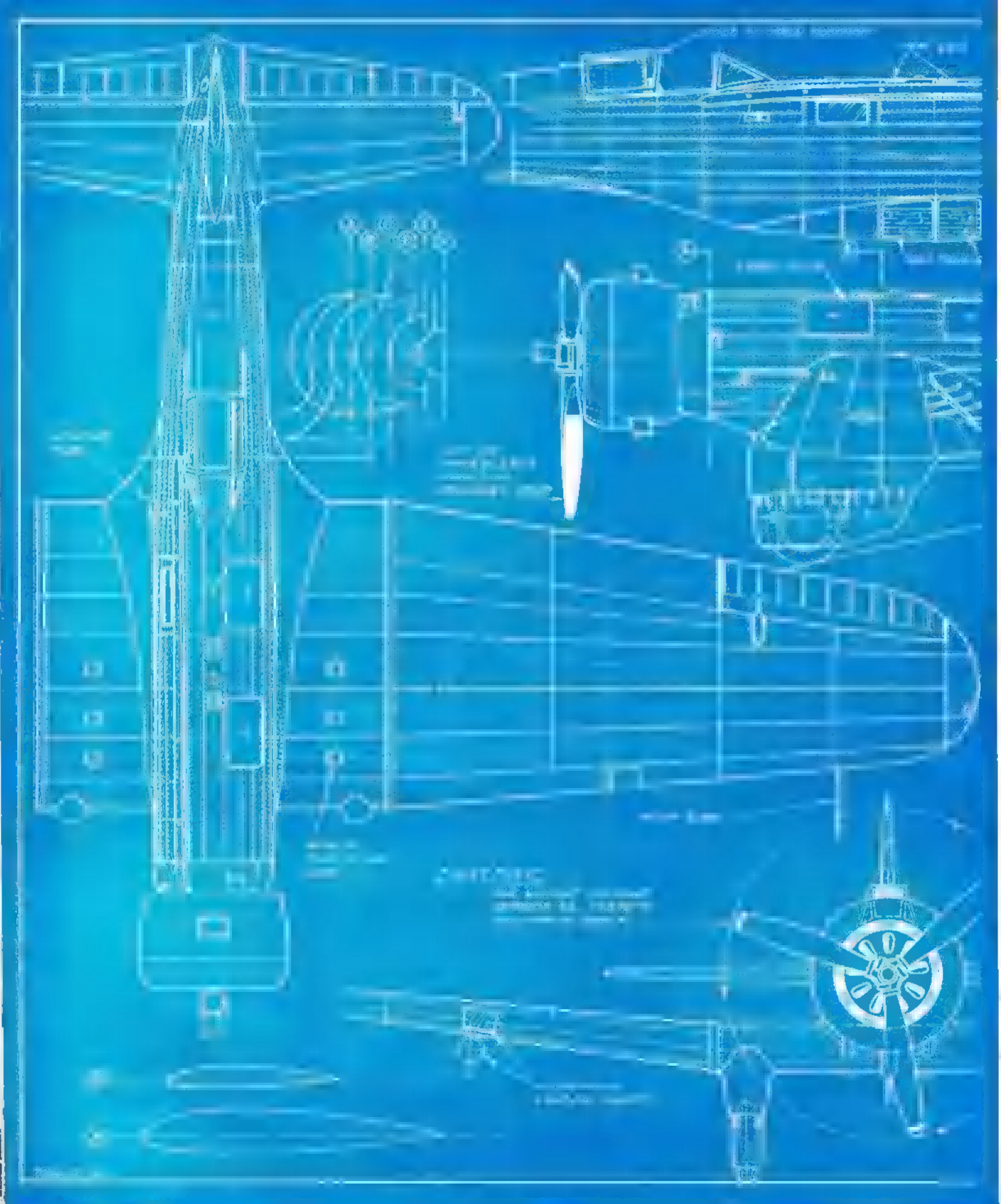
Yet another Gamma got into the racing game: NC-2111 owned by publisher and physical culture fadist Bernarr McFadden. Carrying the owner's name in huge letters along the side, it was flown to third place in the 1935 Bendix Trophy Race at 202 mph by Russell Thaw.

The largest number of Gammas built were Model 2Es, 51 of them came off the assembly lines. For the most part, they were military versions, destined for the Chinese Air Force which, in the mid-1930's, already was fighting what would become the Pacific half of World War II. Armed with just three .30 cal. machine guns and carrying about 1000 lbs. of bombs, they probably were at quite a disadvantage against the fast, maneuverable little Japanese fighter planes.

*(Continued on page 74)*

This rare Model 2L Gamma was used as the flying test bed for the Bristol Hercules sleeve-valve engine which was later to power such vital combat aircraft as the Bristol Beaufighter.


Photos Courtesy of National Air ■ Space Museum

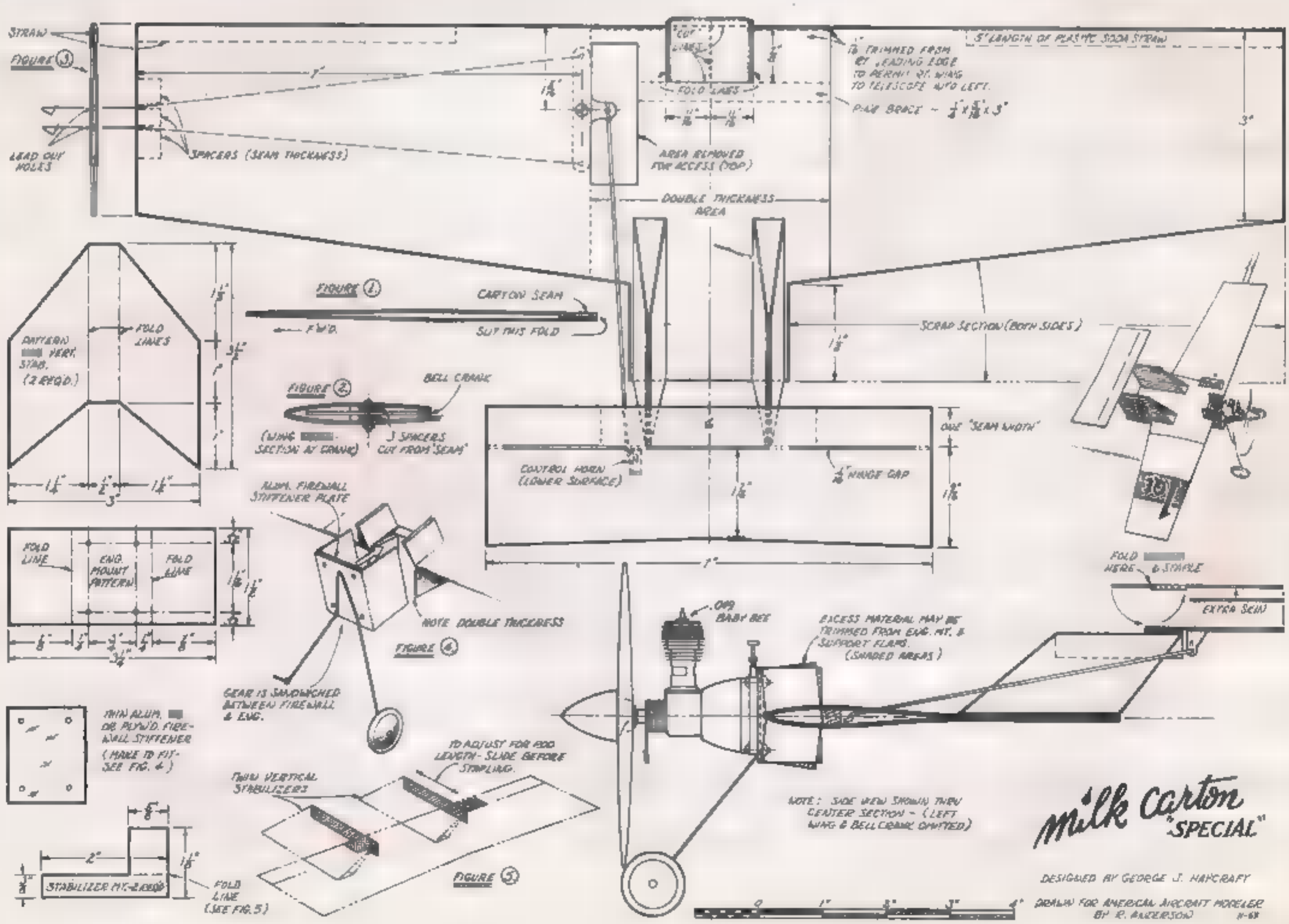


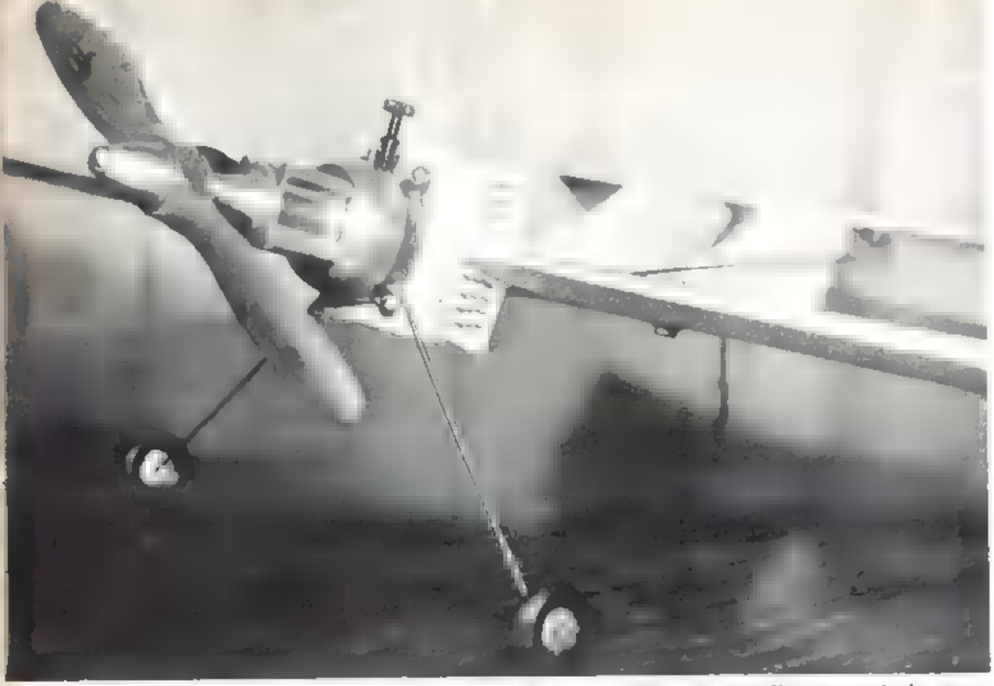
# Northrop Gamma


NORTHROP
DRAWN BY:

Bright color scheme [redacted] applied with felt-tipped pen [redacted] by using regular model dope [redacted] the already fuel-proof plastic coating.

# Milk Carton Special





Landing gear wire is held in place by the engine mount. When flying off grass, omit the gear. To improve line tension, rotate engine cylinder to right before mounting.

**Stapled together, this tough plastic-coated cardboard job costs pennies. If it crashes, you can't cry over spilled milk!**

## GEORGE HAYCRAFT

ARE YOU a stunt or combat flyer who wants a highly maneuverable plane of superior durability and lowest cost? Are you an experienced flyer who wants to experiment with design? Or, are you a beginner who wants to fly with a minimum of construction time? What model could possibly offer so much to so many? The answer is setting on the refrigerator shelf—a milk carton!

Despite any modeler's disbelief in its flying potential, the milk carton will prove itself a great performer. Construction time is low, the basic design is assembled in less than two hours. Durability is phenomenonal. Milk cartons withstand impact which would shatter plastic. Cost is next to nothing. By salvaging the few metal parts from one plane to the next, the price per plane is only about ten cents!

The Milk Carton Special began with no particular form and is now the flying sum of a number of special construction techniques, which were developed as the result of many test flights. The plane is built with a minimum of material and structure in order to keep weight and resistance down and performance up. While the aircraft is remarkably stuntable, it also is quite stable. Surprisingly, if the elevator is shortened to about 3/8", the plane is forgiving of all but the beginner's worst mistakes. For the experimenter, this design is only one of many which are possible. Let imagination be the guide!

### Construction

Used milk cartons will not do for construction. Instead, from any commercial dairy, obtain new quart cartons on which the ends have not been crimped.

Begin by slitting one of the two folded edges so that the carton may be inverted. This puts the printed advertising on the interior of the wing and a nice white surface on the outside. It is important to slit the edge indicated in Fig. 1 so that the seam where the carton was glued becomes the wing's trailing edge on the underside, and can be oriented so that the seam's rough edge will face away from the direction of air flow.

For symmetry, wing dimensions are marked on the top surface only, and top and bottom are cut at the same time. This is true of both left and right halves which telescope together in the center, giving added strength.

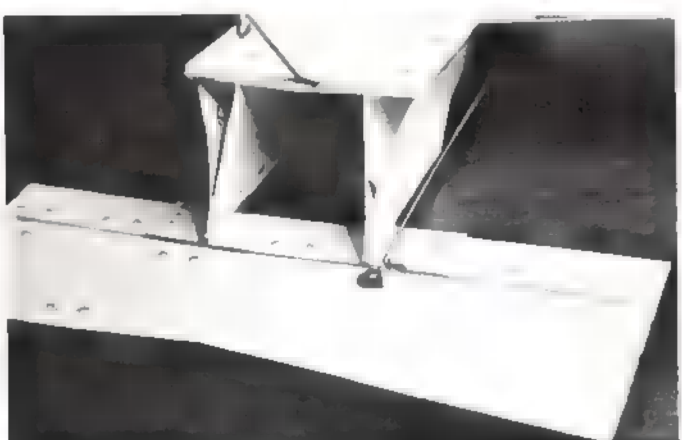
When both wings are marked and cut, install a ½A bellcrank into the left wing. Punch a small hole through the bellcrank point indicated in the drawing, piercing both wing sides. By temporarily mounting the bellcrank on the top and twisting, mark the path traveled by the hole into which the pushrod inserts. Remove the bellcrank and, along this line, cut out a semicircular hole wide enough to accommodate the pushrod. Now install the bellcrank, with the leadouts in place inside the wing sides as shown in Fig. 2. The three spacers above and below are cut from a scrap of the seam where the carton was originally glued.

Hold the wing flat on a table and fasten the trailing edge from the middle to the tip. Use ordinary paper staples thoughout construction—no need to glue and wait for it to dry! The holes for the leadouts are made by putting three spacers from the seam into the tip as it is sealed. (See tip end view, Fig. 3) Before the tip is sealed at the leading edge, insert a five-in. length of plastic soda straw into the wing to act as a spar. Insert an ice pick into the straw to force it up against the leading edge. Finish sealing the tip with a staple where the straw tip is.

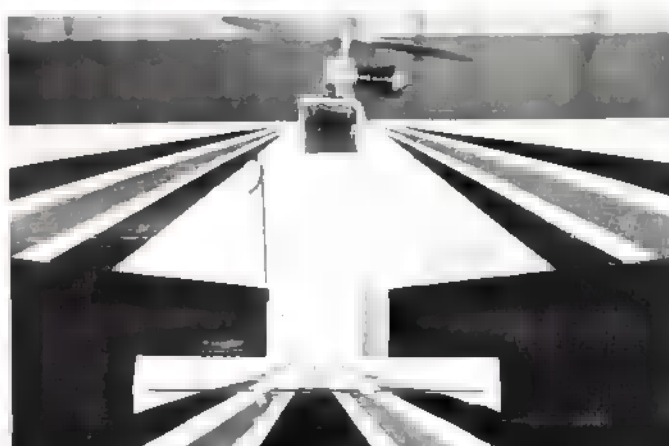
The right wing is cut and assembled in a similar manner, with a few exceptions. There is no bellcrank system. However, rectangles are removed from the left side of the wing near the leading edge as indicated in the drawing. This allows for free movement of the bellcrank. The straw extends onto the edge of the motor mount.

The wing is assembled by telescoping the right side into the left until the motor mount flaps and the back edges coincide. Before joining, remove a 1/16-in. wide strip of the leading edge on the right wing where it is covered by the left. Now, hold the leading edges of the

*(Continued on page 87)*



Staples are evident everywhere. Copy their positions from these photos. Note the multiple layers as tail skid mount.

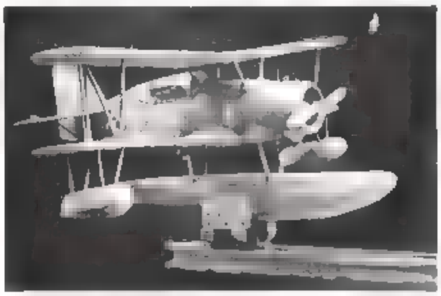


Engine offset also promotes good line tension, especially during takeoff. Bellcrank can be external, if desired.

# C/L BILL BOSS

## General Correspondent SPORT and SCALE

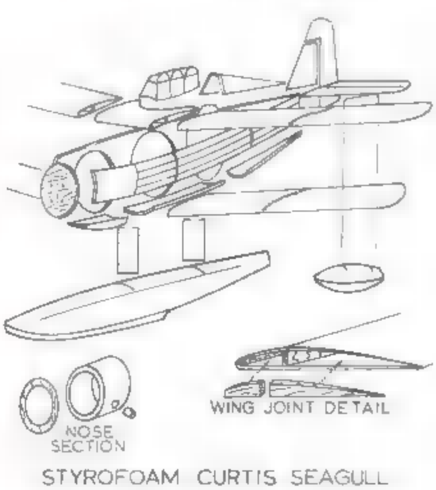
Unusual Modeling Materials: Make a scale model plane out of coffee cups and serving trays—yes, that's what I said! Coffee cups and serving trays made of styrofoam are the novel and inexpensive materials used by Leslie Spicer. An aircraft metalsmith, he has built models using all the standard materials, but during the past year he decided to try something new. As a result, he has developed [redacted] technique for making flying models from styrofoam cups and trays such [redacted] those used in supermarkets for packing meats and produce. Among the planes he built with these novel materials [redacted] the Sopwith Camel, Gypsy Moth and the Curtiss Seagull.



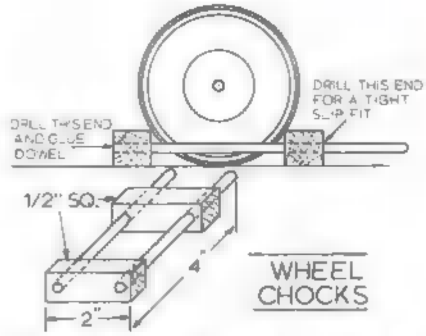
Styrofoam control line scale? Yes! Made of plastic drinking cups. Is catapult launched.

To make the serving trays usable for modeling, trim away the turned-up edge, leaving a flat surface about 6 x 10" (from the larger trays). Square off one end with pinking shears, to provide [redacted] saw-toothed interlocking edge for splicing. Next, run the plates through a washing machine wringer to reduce the thickness and make the styrofoam more pliable. It can now be bent more easily, [redacted] to the point of forming a circle.

To make lengths of foam long enough for wing construction and fuselage siding, join or splice any number of plates together, using Scotch Grip Industrial Adhesive 226. To join plates, apply the adhesive to the saw-toothed edges, place together and let dry. This adhesive can be used for all foam to foam joints, since it is strong, sands well and is waterproof.




Also used are foam trays from supermarket meat counter and packing material. Wood and wire used only where strength is required.




To prevent disaster of model rolling off the workbench, make [redacted] simple wheel chocks.

Spicer [redacted] foam for just about every construction item, including bulkheads which [redacted] made from foam that has not been given the washing machine wring[redacted] treatment. Bulkheads are left full thickness to provide added strength. Wood is used to make the firewall.

Balsa wood strips are used for the leading edge and center spar of the wing, thus providing both strength and [redacted] of forming the wing's airfoil. Piano wire is used to make mountings and struts for the wings, pontoon, and floats. As the plane is assembled, straight pins and rubber bands hold the various parts together while the adhesive is drying.

After construction is completed, cover the plane with Jap tissue, using a watered-down solution of Elmer's Glue as the adhesive. Strips of silk are put over stress joints such as the point at which the wing halves [redacted] joined together. After the tissue is applied and dried, doping won't damage the foam.

*(continued on page 79)*

Ed Thomas shows off unique semi-profile stunt model. Foam winger has built-up [redacted] to enclose most of the engine and tank. Streamlining does improve appearance.

# C/L JOHN BLUM

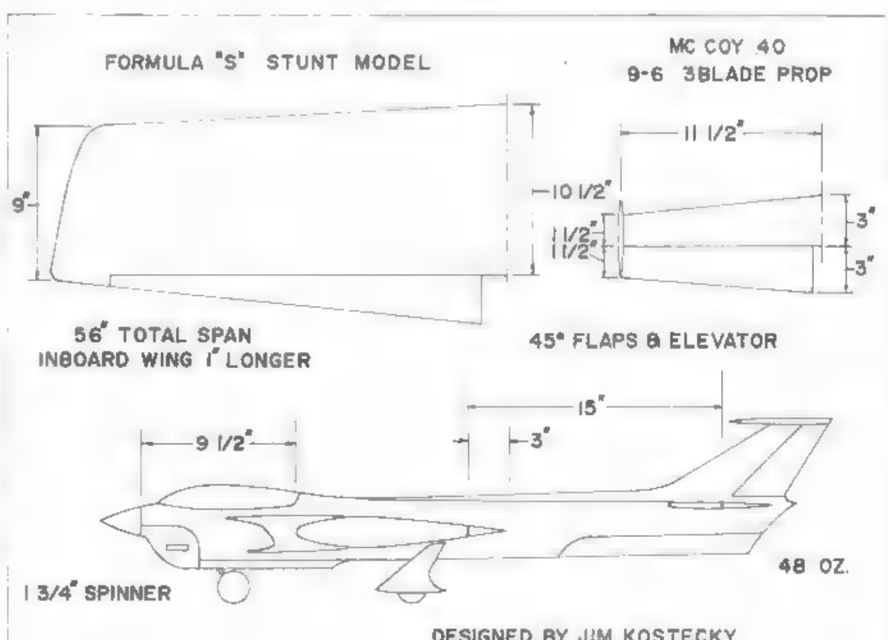
## Specialist Correspondent CARRIER and STUNT

Stiffen Pushrods: The larger stunt models often have problems with elevator pushrods. As the fuselage grows longer, so does the pushrod, which also increases the possibility of flexing because of unsupported length.

Al Sugar suggests two solutions. (1) Make up the pushrod in two separate pieces, allowing [redacted] to overlap the other about one-half the length, then bind them in several places with wire and fasten with solder. (2) Install a one-piece pushrod to which is attached [redacted] ⅛" dowel [redacted] 80% of the pushrod length and which is fastened to the pushrod with thread and glue. These solutions provide more strength (stiffness) in the pushrod, thus permitting [redacted] positive control. . . .

Builder of the Model: In light of recent proposals [redacted] eliminate appearance points in Stunt, and in view of knock-apart models with foam wings, fiberglass parts, etc., the place of the builder-of-the-model rule in future requirements is in question. Pre-fabs may become the thing as they have in other facets of modeling, and the appearance of the ready-built would come as no great shock. Buy today, fly tomorrow may be the motto. Rules changes always present some hidden facets which may or may not create problems. . . .

Kostecky's Big Stunter: Jim Kostecky feels his Formula-S Stunt model (photo, April 1970, AAM) is his best effort [redacted] far, from all aspects of aerodynamics, impression and durability. In seven Nationals, he and his models have placed in the top six.



Jim suggests that the elimination of appearance points would encourage more participation in the stunt event. He also feels this would align competition [redacted] closely with FAI activities. Considering the difference in scoring, the transition from AMA to FAI requires a change in point concentration. . . .

**A pair of Martin MO-1 carrier jobs by Don Gerber sports [redacted] much [redacted] detailed finish. One uses [redacted] K&B, the other a S.T.**

Line Load During Flight: Control line diameters [redacted] under discussion, and nomographs [redacted] available for this calculation. However, for a quick estimate, weigh the airplane and use the following formula: F = M (V squared /R). [redacted] is force in pounds. M is W/G, where W is weight of model; G is gravitational pull (32 ft. per sec.). V is velocity in ft. per sec.; [redacted] is radius of flight circle. Example—100 mph for a three-lb. model: F = 3/32 x 147 squared/60; [redacted] = 3/32 x 360; F = 33.75 lb. Add a 10% safety factor of 3.75 lb. equals 37.5-lb. load on the lines. . . .

Carrier Engines: For those pondering [redacted] new engine, a review of the engines (and other equipment) used by the winners at the Nats may offer [redacted] guidance. The Nats Product Booklet (compiled by AMA) shows 13 Supertigres, 12 K&B, 2 O.S. Max, and 7 Rossi, plus 3 others, for a total of 37. All the Rossis [redacted] in Class II Carrier. . . .

U.S. Aerobatic Championships: Planned for summer of 1971 in the St. Louis area is [redacted] All-Stunt Contest to pick a Grand Champion. Events will include Old-Timers and AMA Stunt, as well as Grand Champion and Unlimited events. The latter, which expands [redacted] [redacted] series of unpracticed maneuvers in an unusual manner, sounds exciting. Contact Tom Niebuhr, 1170 S. Florissant Rd., Florissant, Mo. 63031. Tom has information on plans for the Old-Timer stunt models.

**Gerber's Guardian also is well detailed, has adjustable leadouts and tiny racing wheels. Plenty of wing area, but no flaps.**

# C/L JOHN SMITH
## Specialist Correspondent
## SPEED and RACING

New Engines for 1971: Roger Theobald and John Barr plan production of their A.R.M. Diesel, [redacted] FAI-sized engine they developed for International FAI Team Race Flying. The design has three ports, side-exhaust, and drum rotary induction, and features [redacted] one-piece case-cylinder-front cover construction. Weight is about the same as the Supertigre 15. The engine has conservative timing [redacted] insure a good top end performance, along with good milage and easy starting. Price will be in the $60-65 range.

John and Rog are also doing custom set-up work [redacted] the S.T. diesels. Both of them were members of the 1970 U.S. FAI Team Race Team and really know their way around the Team Race circle. For information, write 401 North Pass Ave., Burbank, Calif.

Frye and Roselle, current C record-holders, are in production on their 65 piped record engine. It will be a carbon copy of the one used to turn 197+ mph at the 1969 Nats. The price of this engine will be $200 and no free samples.

I understand they also will be building a three-port, rear-exhaust, unpiped 40. The exhaust will be split to run out and back on both sides of the cowl. No price on this one yet, but check with Jerry or Jack at 5058 Copeland, Dayton, Ohio 45406.

Anyone who brings out a [redacted] speed engine in these troubled times deserves [redacted] large pat [redacted] the back. Ask any manufacturer—a speed engine dosen't pay its own way down the assembly line. Most manufacturers produce them as a favor [redacted] the competition flier. The competition engine needs hours and hours of engineering and design time but makes up [redacted] very small part of total production and sales. . . .

Takeoff Dolly Kits: Walter Brassell, 4361 Montview Dr., Chattanooga, Tenn. 37411 will send all the details. The dollies come in kit form or ready-built and can be chrome-plated to order. How fancy can [redacted] get? The drawings [redacted] quite professional and I assume workmanship on the dollies will be the same. It [redacted] a well-designed lock-on type. The only possible trouble spot is the wing support which is [redacted] fixed height above the centerline of the pan. Bending this support up or down should take care of it. Here is a good example of much-needed equipment being made available by small manufacturers. Other specialized items for speed [redacted] sorely needed. . . .

Household-Hint-Of-The-Month: When building hard tanks, brass or tin, make darn sure the brass tubing is clean inside. I have run into [redacted] brass tubing with a buildup of corrosion inside. It results from many causes and is not the fault of the manufacturer. Corrosion is caused by chemical reaction (pollution, you know) and [redacted] be removed easily.

First, clean the outside of the tubing by polishing with fine sandpaper. This will make soldering [redacted] lot easier, besides making the tubing look pretty. Next, take a piece of tubing one size smaller (for ⅛" use 3/32"), file the end square and leave the burr that is formed. Use this piece of tubing to hone the inside of the fuel tubing to remove the buildup of greebles usually present. When running the tube back and forth, rotate it to hit all inside surfaces. The stuff which is cleaned out is what caused that last erratic run [redacted] funny needle setting.

It doesn't hurt to lightly sand the brass stock used for the tank too. Your ship may not go any faster, but you'll have the satisfaction of knowing you have the cleanest tank in the field. . . .

Magesium Speed Pans: Nick Arpino has his new speed pan [redacted] the market. This one is C-sized; hopefully, smaller sizes will be offered. A magnesium casting, the pan measures 20-in. long and features bendproof construction, large engine and tie-down pads, and [redacted] integral cast-on skid. There is plenty of [redacted] for the largest bladder or hard tank. Production will be limited, so order early. Prices were not available at press time, so check with Nick, 301 Wood Acres Rd., East Patchogue, N.Y. 11772. . . .

Rules, Rules: The new rules books should be out by now. After complaining about the ones you don't like, take an hour or two to read, digest and become familiar with the rules for each event you fly. Also read the General Rules which are basic to all events. Then make sure your equipment meets these rules. This will [redacted] [redacted] lot of problems at the processing tables at the next meet. . . .

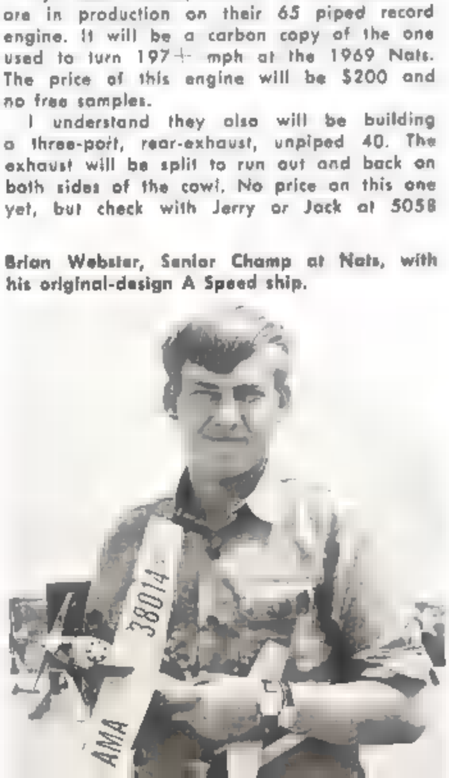
Wedding Bells Ring: Old (really not that old!) Bill Kirn tied the knot Oct. 30, 1970. Bill is a speed type from way back. Remember the Texas Whammy design? Bill introduced us to his wife-to-be way back at the Olathe Nats. Either Bill has slowed down through the years or his wife is a fast runner. Anyhow, congratulations to Bill and Jan. May you both have many happy years. . . .

New Records: Nick Wisniewski, Bill's boy, set [redacted] new Jr. A Record of 152.22 mph. No details [redacted] equipment but it had to be K&B. Jim Wade set two more ½ A Proto records. He turned 86.09 mph in Profile and 95.60 in inclosed Proto. The records [redacted] set at the Golden West CL Meet at Garden Grove, Calif., Oct. 18, 1970.

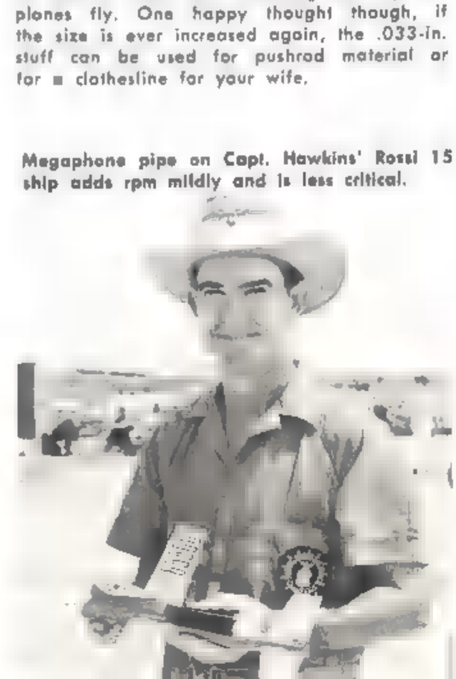
Reports [redacted] that the speed fliers were coming out of the woodwork. This seems to be the case in a lot of contests. . . .

Thought-of-the-Month-Department: If the new line-size proposals [redacted] through, it may be [redacted] fun watching the C fliers wind up 70 ft. of .033-in. wire than watching the toy airplanes fly. One happy thought though, if the size is ever increased again, the .033-in. stuff can be used for pushrod material or for [redacted] clothesline for your wife.

**Brian Webster, Senior Champ at Nats, with his original-design A Speed ship.**



**Megaphone pipe on Capt. Hawkins' Rossi 15 ship adds rpm mildly and is less critical.**



# F/F BOB MEUSER
## General Correspondent
## SPORT

NFFS Symposium: Your General Correspondent has been named editor of the 1971 Symposium Report of the National Free-Flight Society. The Symposia started in 1967 because of a feeling that the technically-oriented background of free-flight needed exposure. The Symposium provides exposure and serves as [redacted] outlet for constructive discussions, analysis, documentation, etc.

The Symposia have provided incentive for significant work which otherwise would not have been performed at all, much less documented. While the technically-oriented papers in the Symposia reports have expanded in number and, to some extent, increased in quality, as successive authors were able [redacted] build on the foundations laid by preceeding ones, the non-technical aspects have not been neglected. The non-technical content of the 1968 and 1969 reports is alone well worth the price, and the addition in 1970 and 1971 of the Ten Models of the Year makes it a bargain for free flighters.

Those with either technical [redacted] non-technical material [redacted] contribute to the 1971 Symposium Report should send me a summary or abstract immediately through AAM. Absolute deadline for final copy is April 1, and all papers must be scrutinized by the selection committee beforehand. For information about obtaining previous reports, and for advance orders for the 1971 report, contact Annie Gieskieng, 1333 S. Franklin 't., Denver, Colo.

Richard Sironen: Rich is the 15-year-old who won the Boeing scholarship last sum[redacted] started out in CL, then switched to FF in mid-1969. During the following year he built five Nordic gliders, plus models for six other events in the Boeing contest. In addition to modeling, he plays the clarinet and bassoon (makes his [redacted] reeds!), fishes, skis,

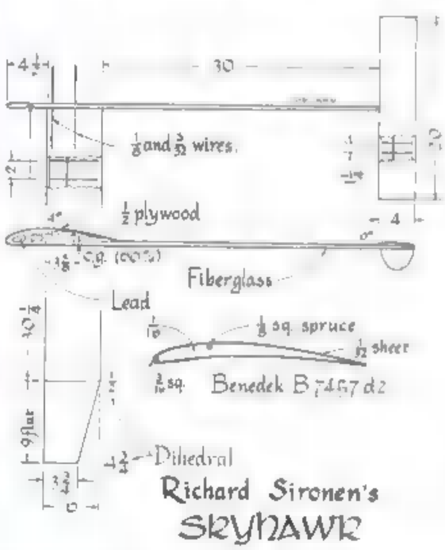
(continued on page 80)

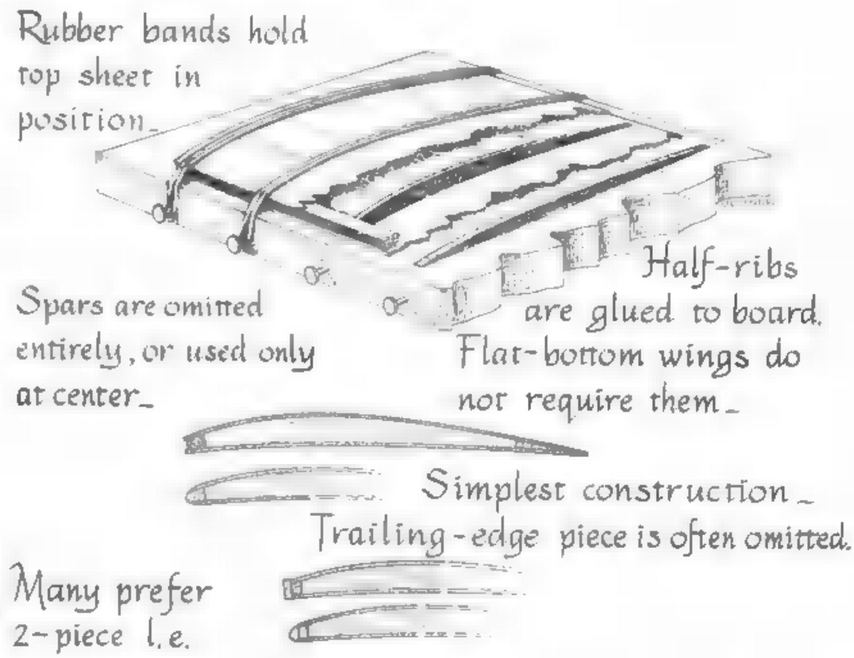
**Very thin 4¼% airfoil [redacted] fast climb and glide on Pete Vacco's Cox 09-powered A Gas job. No warps with sheeted [redacted]**

**Richard Sironen advocates all-sheet wings where weight is not critical. Boeing photo.**

**Most obvious advantage is quick assembly.**

**The thin spruce spar causes D-tube effect.**



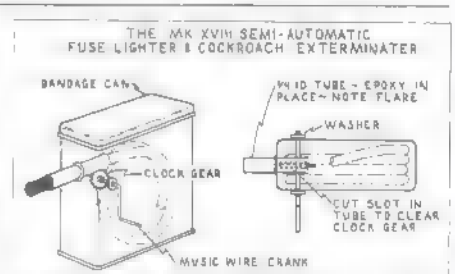




# F/F BOB STALICK
## Specialist Correspondent
## GLIDER and RUBBER

Bulletin Board: Wurfgleiter Wettbewerbs. With spring upon us, the Postal Contest season descends with equal vigor. The German Thermikschnuffler club is sponsoring an International Postal for hand launch glider. The rules are precise:

You will fly any day in March, 1971. Your model may be built by any construction method. Teams will consist of four members. Ten attempts [redacted] allowed for 60-sec. maxes, with the best six [redacted] added as official. The team's score is the combined totals of the best three members. If this total is 1080 [redacted]c., then additional rounds will be flown, increasing the max by 15 sec. each round, until one member of the team fails to reach the fly-off time.

Results will be sent to: Modellflugklub Thermikschnuffler eV, 6901 Altenbach (bei Heidelberg), Abtsweg 26 (W. Germany). All results must be sent by May 1 and must list all competitors and scores, flying dates, and must include a short description of flying field and weather, [redacted] return address and [redacted] 7 [redacted] 10 cm (approx. 2¾ [redacted] 4") picture of the team. The ten best teams will receive certificates and all competing groups will [redacted] complete results. Sehr gut! Jawohl. . . .




**Quick-Wick thing won't burn your pocket.**

Minis-Maxis and Star-Skippers: From Richard Whitten, age 11, comes a well-written and charming newsletter, which he edits. Rich-

(continued on page 81)

# F/F WALT MOONEY
## Specialist Correspondent
## SCALE

Always a favorite, Rearwin Speedster made by G. Ginn from small 3-views has 48-in. wingspan.

How to Fly a Low-Wing Model: Basically, flying problems with low-wing models usually begin [redacted] the designer's drafting board. Most of the interesting low-wing planes have been full-sized fighters or racing planes which are designed for maneuverability and speed, rather than stability and docile flight characteristics. On the other hand, most high-wing planes allow a 75-year-old grandmother to relax [redacted] she flies the Atlantic solo.

Some high-wing models will fly well when built [redacted] exact scale. Most low-wing models will require some scale deviations, but frequently kit models don't have these necessary changes. Most important is an increase in dihedral. For a model to fly successfully it must be spirally stable. Spiral instability in a full-sized airplane is the least important mode and is easily taken care of by the pilot. Many airplanes [redacted] spirally divergent, hands off, and most pilots don't [redacted] recognize it. They just pick up the sagging wing with a little pressure on the top rudder.

By rule of thumb, a low-wing with three degrees of dihedral, a midwing with [redacted] and a high-wing with minus three degrees will *(continued on page 88)*

[redacted] Hamm starts his judging chores at Long Island meet. FF Scale, always popular.

Sopwith Tabloid appears to the flying to the moon. Don Edson's model makes 50-sec. flight, weighs ½ oz.

# F/F BUD TENNY
## Specialist Correspondent
## INDOOR

Indoor Symposium: One of indoor modeling's basic problems is that its building techniques differ greatly from those used to construct outdoor models. One solution is [redacted] special Indoor Symposium such as that held recently by modelers in the St. Louis, Mo., area. A typical program might include action [redacted] instructional films, demonstrations of technique, technical discussions, and question-and-answer sessions. . . .

Why Wing Sockets?: Wings on early indoor models were mounted on clips which allowed the wing to slide along the motor stick. Thus, wing and tail incidence angles remained the same, and the wing was moved with respect to the model's center of gravity. With the advent of plug-in wings, it [redacted] possible to place the wing at the theoretical best location. If [redacted] model wasn't happy with the modeler's pet theories, he just changed [redacted] wing incidence until it flew anyway! . . .

Stuck [redacted] Sockets?: Theories have improved since, and we know pretty well where to put the wings. The plug-in wing is the most structurally efficient method of mounting indoor model wings. In fact, modern braced wings depend greatly upon properly aligned and solidly mounted sockets.

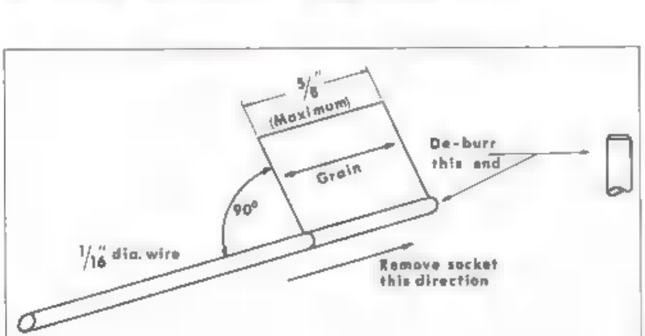
Lightweight wing sockets now are little [redacted] than three or four layers of jap tissue laminated with thin glue, and they [redacted] quite fragile until the glue dries. Sockets usually [redacted] formed [redacted] stiff, smooth wire. The form must be perfectly straight and polished with steel wool [redacted] be [redacted] no burrs [redacted] on the end of the wire. Cut several [redacted] x 1" pieces of tissue, with the grain running parallel [redacted] the ⅝" sides (jap tissue tears easily in the direction of the grain but leaves a very ragged edge when it is [redacted] across the grain).

Study the sketch while reading these directions. Once you start rolling [redacted] socket, you can't stop until it is finished. Put thin glue along one short edge of the tissue and place the wire in the glue so that the tissue adheres to the wire. [redacted] sure the tissue is aligned properly and put extra glue [redacted] this tissue next to the wire. Roll the paper onto the form, so the excess glue is squeezed toward the far edge of tissue. Twirl the wire between the fingers so that the tissue is rolled as tightly [redacted] possible, and excess glue is squeezed out.

Just as soon [redacted] the wrap is smooth, and before the glue has a chance to dry, slide the socket off the wire and let it dry. It should be allowed to dry overnight, then it can be trimmed to length with [redacted] sharp razor blade. Be [redacted] clean the wire with thinner or steel wool before rolling another socket, or the [redacted] socket may stick [redacted] the wire. . . .

Flying Sessions: Indoor flying sessions [redacted] scheduled at the M.I.T. Armory, Cambridge, Mass. Sessions are Feb. 20, and Mar. 20, 1971; a contest is set for April 10, 1971. Contact Ray Harlan, 15 Happy Hollow Rd., Wayland, Mass. 01778 (phone 358-4013), for more details.

Wing sockets [redacted] adjustable, rigid, and light. Rolling the Jap tissue takes some practice, delicate applications of thinned glue, and patience. Most important [redacted] clean waxed wire.




Ron Stransky winds Ron Silvia's model at a contest. Much [redacted] be learned about modeling and flight from indoor rubber jobs.

# R/C DON LOWE
## General Correspondent
## SPORT and PATTERN

Whose Responsibility?: Frequency mix-ups at contests can be upsetting and disastrous—and hard [redacted] airplanes. It does happen now and then, despite careful planning. What should the sponsoring club's reaction be, presuming that the contest management is at fault? I've seen a variety of responses from "Gee, we're sorry, I hope you aren't mad at us," to "It was our fault so we will [redacted]-place your loss."

At the Wright Brothers Memorial Contest this year, [redacted] replaced the offended flier's loss. The Indianapolis Meet managers responded in like manner. Not [redacted] [redacted] at least one other intsance I witnessed this year. I feel the club or sponsoring activity should assume this responsibility. What is your opinion? . . .

Perhaps it had to happen—a fuzzy, way-out Mod Pod named Molly, created by Roy Anderson.

Note: Contest management error caused this interference shoot-down and the host club responded by replacing the model.

Indianapolis Meet: Norm Page continued his winning ways to take Class [redacted] Expert at the Indianapolis Meet. Jim Millikan copped first in Class A and must [redacted] move up to B [redacted] C. He also nosed out my son, Jon, who is moving up in Pattern competition. Other winners were: Class B, Bill Weesner; Class D Novice, Bill Richards, Bill Johnson; and Formula I, Ken Duncan.

Norm Page and I had a spectacular mid-air in the first heat of Formula I. . . .

Canadian News: From Yankton, Saskatchewan, Brent Reusch reports three out of eight members [redacted] the local club [redacted] 14 to 15 years old. Enclosed contest results reveal that Garry Reusch, 14, is a real competitor, with five wins [redacted] placings in 1970 Canadian contests. He even beat his dad once in Pattern!

It [redacted] a terrific thing to encourage junior members [redacted] any way possible, including competition. Where can you find [redacted] [redacted] challenging activity for youngsters? . . .

Frequency Survey: [redacted] Aberle reports [redacted] a recent radio equipment survey made in the Long Island Radio Control Society. One club may not be a national sample, but the results are interesting.

Out of 43 members (48 total) responding, results were [redacted] follows: Total Radio Sets Owned—88; Stick Modes Digital Equipment—Dual Stick, 76%; Single Stick, 24%; Frequency Distribution—27 Meg, 41% (most popular, 27.045); 72 Meg, 46% (most popular, 72.08); 6 meters, 13% (most popular, 53.2).

Won't it be great to have equipment with "select-a-frequency"? I understand that this capability is in the works by some manufacturers. It will make for [redacted] club sport flying [redacted] will be a tremendous aid to contest management in setting up equal flight lines. Pylon heat scheduling would be [redacted] snap. It will also insure that pylon fliers [redacted] fairly matched with all competitors. At present, [redacted] is relatively easy for fliers to avoid competing with the "hot shots" by flying on their frequency. . . .

FLIAR Suggests: The Forest City Flyers (London, Canada) newsletter, "FLIAR," makes suggestion which will ensure that elevator and rudder horns do not loosen or fall off due to vibration. Instead of using bolts, nuts and washers furnished with some brands, thread a 4-40 or larger bolt into the holes cast in the control horn. This friction fit in the nylon material will not loosen. I have done this for years and never have had a control arm failure. Vibration is a major problem so pay particular attention to its possible effects when planning and making radio and equipment installations.

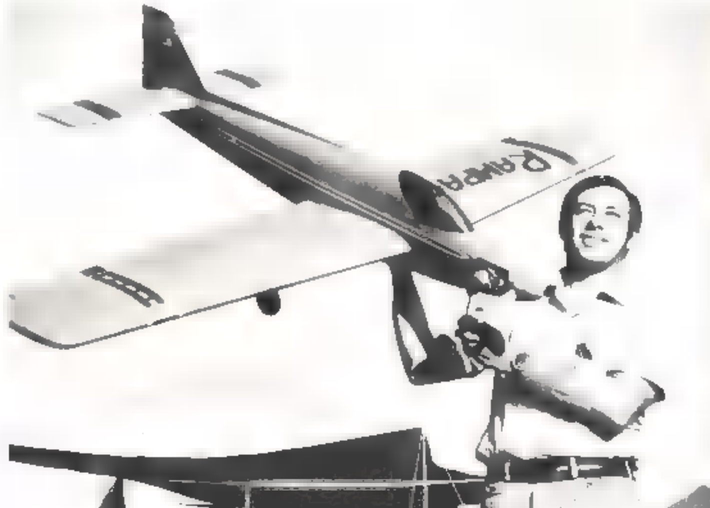
Another idea from the "FLIAR" suggests using [redacted] electric carving knife to cut foam blocks to shape. . . .

More on Mufflers: Mufflers are [redacted] controversial subject, but some clubs' recognition of real or possible noise problems has forced their use. Our club began requiring mufflers two years ago, strictly as [redacted] preventative measure when houses were built adjacent to our fields. Many other clubs now require mufflers, but there usually is no finite definition [redacted] to what is acceptable. FAI pylon provisional rules require [redacted] "effective muffler" but do not define that term. Mufflers also are required for FAI pattern competition. Who would want to travel to Europe for the FAI International Pylon Championships only to

*(continued on page 78)*

Youth power wins. Junior members of the Saskatchewan, Canada, club are Gary Achtemichuk, Greg Hilderman, Gary Reusch, and Peco Chorney. Photo by Brent Reusch.

Jerry Worth's distinctive RamPage [redacted] a graceful flyer. His control line and stunt background influenced the design.



## R/C GEORGE SIPOSS
Specialist Correspondent
**R/C CAR RACING**

The Kyosho Corp. prototype car runs in the rain [redacted] a race in Japan, is [redacted] available here.

Tuning the Kyosho [redacted] before rains [redacted]

ROAR Rules: By now the 1971 ROAR rules should be available. Changes were relatively minor and designed primarily to define some moot points and to prevent the influx of "thingies." A thingie is a four-wheel, radio-controlled vehicle which bears little resemblance to actual [redacted] cars. To keep the hobby dignified and to enable the trade to meet the demand, simple and straightforward rules emphasize [redacted] and workmanship rather than promote speed only. We have [redacted] some very fast machinery lately which would have placed high in [redacted] concourse competition. . . .

Readers' Hints: Thomas Sullivan suggests the following air cleaner. Attach a tin or brass tube to the carburetor intake, drill holes in it and wrap a Filtron element around it. Filtron is [redacted] open-cell foam material used for desert motorcycles or dune buggies.

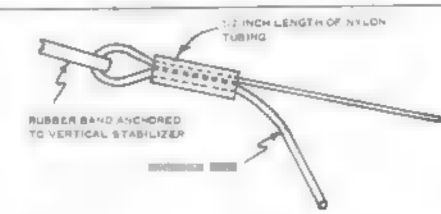
John Thorpe presents [redacted] simple method for body mounting. Get [redacted] strip of Velcro from [redacted] yardage shop, attach it to the bottom edge of the car body and attach a corresponding strip to the chassis. Velcro strips adhere to each other by the action of tiny hooks and loops and keep the body [redacted] securely.

Don Rhodewalt suggests that, when making an intricate wire form out of piano wire, soft floral wire be used to work out the design. It can be bent to the desired shape and used as [redacted] template for the difficult-to-bend steel wire. Floral wire can be obtained in one-ft. length from flower shops. . . .

Racetrack Safeguards: To prevent lawsuits, most RC car racetrack organizers erect a simple 1 [redacted] 4" wooden barrier around the track or at least in front of the spectator areas. The planks can be in eight-ft. lengths, fastened together by rope so they can be easily dismantled and transported. In addition, site insurance can be obtained by ROAR club members from WAM, 228 Culp Ave., Hayward, Calif. 94544. . . .

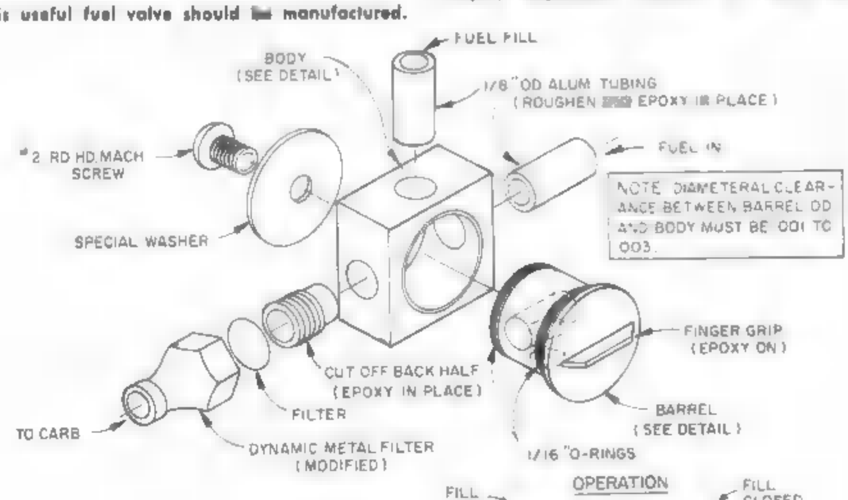
Belt-Drive Sources: Those who prefer belt-drive instead of gears may find it difficult to obtain the appropriate belt in local stores. Try the Sears Roebuck catalog or write to one of the following: Belting Industries, Box 956, Union, N.J. 07083, or Plastock Inc., 145 Lodi St., Hackensack, N.J. 07601.

## R/C FRED MARKS
Specialist Correspondent
**TECHNICAL ITEMS**
**AERODYNAMICS**




Simple, adjustable antenna tie won't fail.

This useful fuel valve should [redacted] manufactured.




Fueling and Filter Valve: One addition should [redacted] made to last month's fuel system ideas. The fueling arrangement for the Nobler, [redacted] described, could benefit from an excellent device worked up by Jerry Smith and presented in the Tri-Valley R/C news.

Fig. 1 shows the general layout of the valve, which filters the fuel, provides a positive shut-off to the engine, and permits refueling without pulling the fuel line apart. It is light and, because of the unique use of O rings, doesn't leak.

However, a neat bit of workmanship is required if it is to function properly. I would suggest the addition of separate mounting screws rather than having the valve hang loose or rather than being tempted to mount it with the machine screw pictured. This looks like a good commercial bet and should be readily moldable from nylon. . . .

Simple Ideas, Old Problems: Simple ideas are the ones that help overcome those age-old problems we assumed had already been solved. For instance, tie a knot in the receiver antenna to attach it at the tail of the airplane. Frank Williams uses this simple approach (Fig. 2) to permit easy removal or attachment of the antenna. . . .

Too Good to Keep: It's sometimes easy to forget that many modelers are brand new to RC and don't know the developments in its interesting history. Rich Noah, a student at [redacted] of Missouri, asks, "What is the difference between pulse and galloping ghost? Just before I went to school, I purchased three ½A RC models operated with escapements: Schoolgirl, Schoolmaster, and Cosmic Wind. Since they have only rudder control, I don't think you will believe what follows. I can do loops, Immelmanns, wingovers, and rolls with these models on an .049 engine. Which system, pulse or GG, would be best for more

*(continued on page 77)*

# R/C CLAUDE McCULLOUGH
## Specialist Correspondent SCALE


D.H. Twin Otter model flies like the real plane, is docile even [redacted] engine. Span 11½".

On One: Robin Lehman's latest project is a giant 11½-ft. D.H. Twin Otter said to have superb handling characteristics even with [redacted] engine out. His experiences have produced [redacted] further advice on multi-engine flying.

(1) When flying with an engine out, it is best to correct with rudder trim instead of aileron. Use of aileron increases wing drag and this does not help flying qualities.

(2) A model which seems impossible to control on one engine can usually be tamed and the flight continued by pulling back partially on the power.

(3) Make the landing approach turning toward the dead engine—which is the way it wants to go anyway. Fighting against the operating engine by turning toward it will lose more height and make control more difficult. . . .

Gee Whiz: Cross off another "impossible" RC Scale subject! Hale Wallace says his Gee Bee R-1 flew like a dream. The specs sound more like nightmare material: 50" span, 9" chord, about 300 useful sq. in., 13" dia. fuselage, [redacted] lb. 10 oz. Even counting the area submerged in that barrel of a fuselage the wing loading was at least 45 oz. per sq. ft. wet. A 13½" dia. prop driven by a S.T. 71 seems to leave only [redacted] ½" bite out in the open but the cowl taper allows for somewhat more, but not much! After one false start, the Gee Bee was off like an arrow and put on [redacted] ten-minute show, including low passes and rolls. Landing approach took 50% power to stay in the air and the model was damaged when too much was fed in too soon on an attempted go-round for another try. Hale compares handling characteristics to [redacted] Goodyear, at least in full power flight, and feels a bigger version with [redacted] 80 would go even better.

He has movies of the flight but AAM is not printed in Super Eight. First item for Test Flight Check List on all new scales: "Take photos.". . .

Dear Santa: The Mattel Vac-U-Form toy has been out of manufacture for some time and has disappeared from sale, to the chagrin of scalers without one to use for small moldings. Now Sears Roebuck appears to have bought the remaining stock and offers the vacuum machine and packages of plastic sheets for it in the current Christmas catalog (good until July 30, 1971).

For a first project make some molds and turn out instrument rings from clear plastic. Paint the edges black and there's the main ingredient for a cockpit as good as Maxey Hester's Ryan ST which features vacuum-formed parts and details. . . .

Scale Data Sources: Regional offices of the FAA have on file the original ATC data, including construction blueprints of most of the aircraft that were certified in their district. Copies will be provided at cost of duplication and handling. If the manufacturer is still in business, a release must be obtained, but this should be no problem except possibly on currently-produced types. Most useful drawings [redacted] 3-views, inboard fuselage profiles and wing, aileron, flap, fin, rudder, stabilizer and elevator frame assembly layouts. These are particularly helpful [redacted] fabric-covered airplanes for duplicating scale structure.

A complete set of drawings for a design might be a little expensive but would provide enough data for a super-detailed bolt-for-bolt museum piece. Best course is to order a few main drawings and decide from examining them how much, if any, [redacted] detail is needed.

FAA Regional Office addresses are: Central—601 E. 12th St., Kansas City, Mo. 64106; Eastern—JFK Airport, New York, N.Y. 11430; Southern—P.O. Box 20636, Atlanta, Ga. 30320; Southwest—P.O. Box 1689, Fort Worth, Tex. 76101; Western—5651 Manchester Ave., Box 9000M, Los Angeles, Calif.

Akrostar model, scaled from fourth place winner of World Championships, couples flaps with both aileron and elevator functions. It also has fully symmetrical airfoils and a big [redacted] up front.

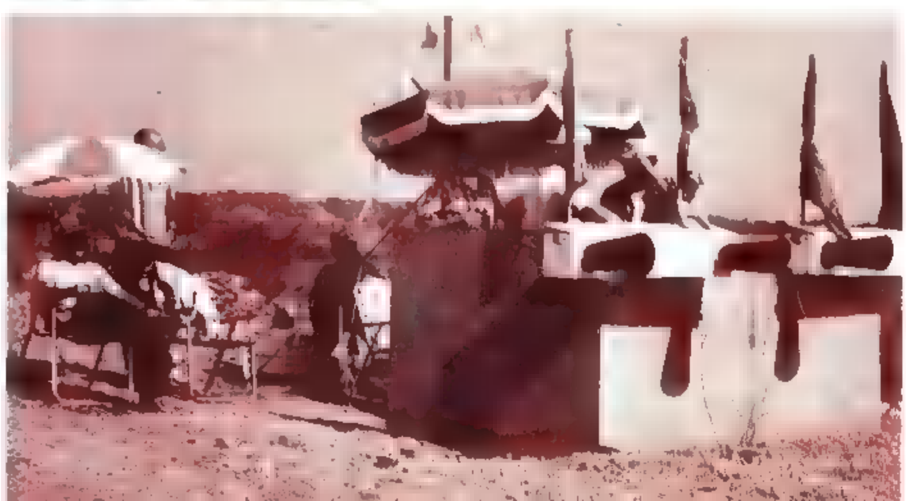
Otter posed with Lehman's Britten Norman Islander, another great flyer. Models often are demonstrated at meets.

# R/C BOB MORSE
## Specialist Correspondent PYLON RACING

Scatter Pylon Signal Lights: Last month, we briefly described the scatter pylon signal light system in use at the Santa Cruz RC Bee's races and the West Coast Pylon Championships, sponsored by the Pioneer R/C Club in Sunnyvale, Calif.

The system has [redacted] some heavy use. The West Coast Championships averaged a racing takeoff every five min. over the two days, and the lights signalled every turn. The lights were everything we had hoped they would be,

It may be called the Duck Blind, but duck does not refer to feathered creatures.

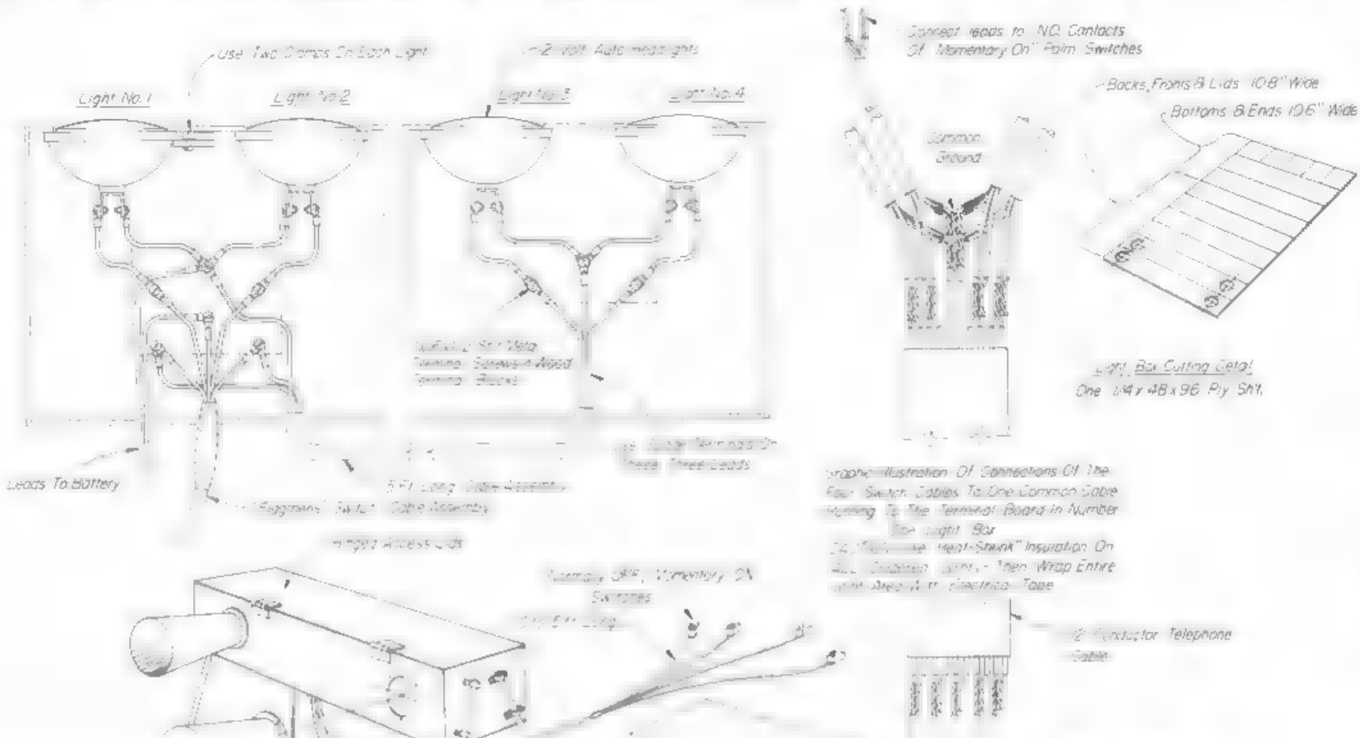


and the flagmen had [redacted] most enjoyable weekend, compared to the rather brutal work involved when using flags two days straight.

To be [redacted] explicit about how to build these lights, details are shown in the sketches. In addition to providing [redacted] easier way for the flagmen to operate, we hoped to come up with a system that could be knocked down in a few minutes, packed up and carted away. All the equipment shown—cable assemblies, sunshades, support legs, etc.—packs into the 10 x 10 x 48" boxes. In transit, only these two boxes and the 12V auto battery must be carried.

Electronic-types may laugh their heads off at the wiring design, but it works well and we'll stick to it for awhile. Connecting cables are 12 conductor telephone cables with ⅜" OD. They make up into a compact bundle when stowed in the boxes. Two conductors [redacted] used for each leg in the circuit. That leaves two unused conductors in the main switch cable and eight unused in the switch

*(continued on page 79)*




# R/C HOWARD McENTEE
## Specialist Correspondent
## GLIDERS and FAI

The high performance and all-purpose Hi Pro sailplane by Michaelis is [redacted] future AAM plan. Suitable for slope or thermal flying.

Thermal Sniffers: There has been much talk about these gadgets, which in the full-scale glider field [redacted] termed variometers and which [redacted] to indicate [redacted] the pilot when he is in rising air currents and how strong they are. Variometers show rising air [redacted] a meter dial; the model types do it by sending a signal from the glider back to a small receiver carried by the pilot. An audio tone of varying pitch (generally, a rising tone signifies rising air currents) conveys the message.

Quite a bit of skill is required to read the signal. The plane must be flown level. If the plane is going up [redacted] down because of elevator movement by the flier, the tone will show this too! The sniffer is most useful when the plane is too far from the flier for him to observe the wing twitches and plane altitude changes which [redacted] signal rising air. As [redacted] sniffer [redacted] comments, the equipment doesn't show where to go to find a thermal, it just tells when the model is actually in one.

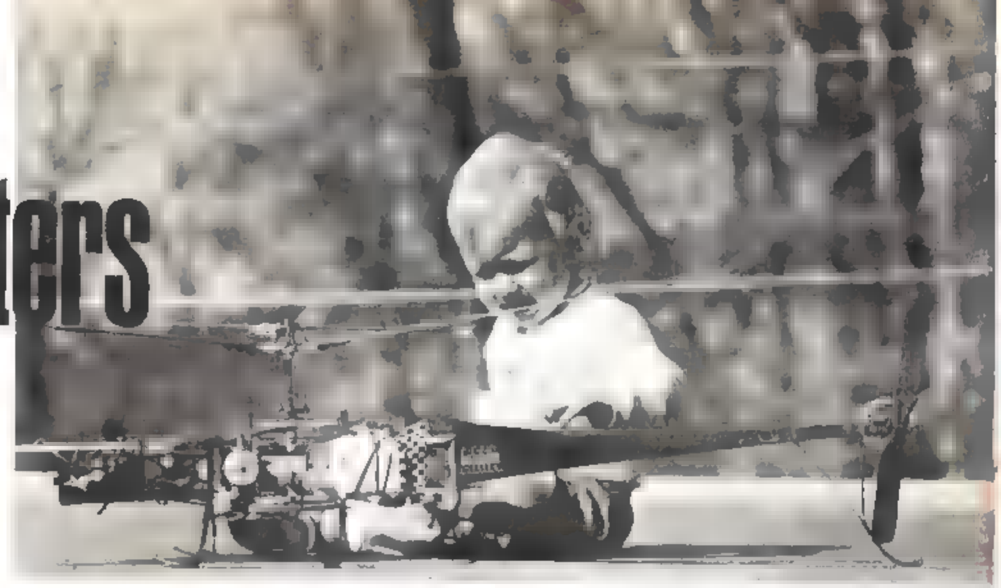
Sniffers [redacted] far have operated mostly on the ham two-meter band, mainly because low-cost receivers [redacted] available for this frequency range. The lowest-price unit we've found is the Lafayette VHF Monitor (catalog no. 99F 35313L; $17.95) covering a range of 146-175 MHz. This range includes the top portion of the two-meter band. Operation in this ham band should be undertaken only if [redacted] has a ham license. Information will [redacted] be available [redacted] a sniffer which operates in the 27 MHz range, and for which one needs no license (transmitter power under 100 mw). It may be [redacted] the market soon. . . .

RC Glider FAI Records: The December 1970 AAM listed an RC Closed Course Glider Record, which had not been verified yet by FAI, of 187.6 miles. It was set Aug. 30, in Hawaii by Californian Robert Boucher. He flew his Malibu glider for over 11 hours over the 100-meter closed course (1510 laps!). The 75-in. span craft weighed 61 [redacted] for the flight; the two controls of Kraft KP-4 system

*(continued on page 77)*

# Designing RC Helicopters

A "chopper" takes careful planning, testing, weighing, and performance prediction. Determine flight capabilities by the chart, then start building.



Successful model helicopters can be small. Flying them takes skill and much practice.


JOHN BURKHAM


DIETER SCHLUTER, winner of the 1968 International RC Helicopter Competition in Germany, has been writing articles on model radio control helicopters for *Modell* (Ref. 1). And it's time someone did the same for an American magazine. In 1967, two articles (*Radio Control Modeler*, Oct., Nov., Ref. 2) described the mechanical aspects of full-scale helicopters. Several books, such as Gessow and Myers' *Aerodynamics of the Helicopter* (Ref. 3), are standards on the subject.

The first three of Dieter Schluter's *Modell* articles describes the workings of real helicopters, including the Bell and Lockheed stabilizing systems—which he tried without success. The fourth discusses his experiments on a flight simulator and how he succeeded in making a model of the Hughes 269A helicopter more stable.

Some typical calculations of model helicopter parameters, such as rotor disk loading and power loading, and some hints based on full-scale helicopter practice are presented in the fifth article. He gets ten pounds of thrust using a 60 engine and the autorotation capability of a medium-size brick. A well-designed model helicopter should give ten pounds of thrust from a 23 engine and have good autorotation as well.

The basic design approach for an RC helicopter is similar to that for a full-scale helicopter or airplane. First, as a design guide, the general specifications, purpose, type of configuration, approximate size and outstanding features of the model must be determined. Next comes a rapid performance calculation for a better estimate of size, performance and payload. Some sketching of the general arrangement of the model can now be done. Try out ideas on fuselage structure, transmission design, landing gear method of attachment, and places for mounting the radio gear, with servos arranged to connect directly and conveniently to the rotor and engine controls.

To complete preliminary design, estimate the weight and center of gravity of all parts of the machine and then calculate the preliminary weight and CG of the model. The CG should fall one-fourth to one-half inch ahead of the rotor shaft in order to balance the air force due to rotor downwash striking the horizontal stabilizer on the tail boom.

Next comes full-scale layout and detail design of the entire machine. Do some stress analysis to make sure the blades won't fly off if the rotor is overrevved. This stage is the meat of the helicopter design and requires a knowledge of mechanical design, rotor dynamics, helicopter stability and control, and vibrations. On full-scale aircraft, more exact aerodynamic performance analyses and complete stress, weight and vibration analyses would be performed. The design then would be constantly changed and improved until it met or exceeded the original specifications.

At this stage of model building, where utmost performance and safety are not required, about all that need be done for the larger models (over five pounds) is to recalculate the weight and CG position to make sure they are still within reason. It also is worthwhile to check for ways of simplifying the design for ease and speed of construction. Try to have someone else, even if he is not quite as knowledgable, look over drawings. A fresh approach can spot things overlooked through over-familiarity.

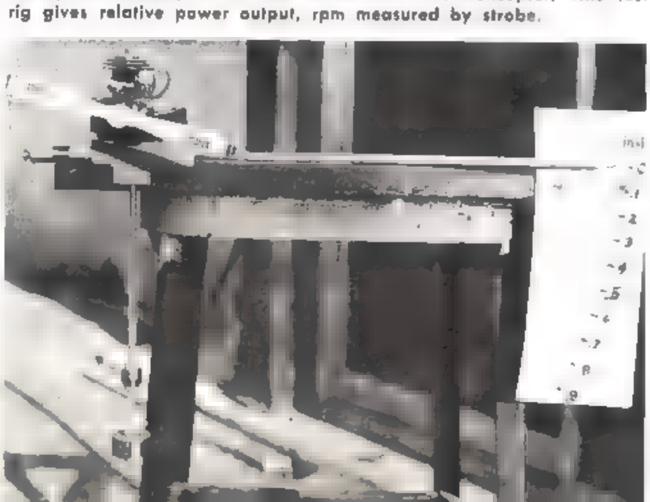
Construction now can begin and should be combined with testing assemblies as soon as they are completed. Necessary changes then can be made immediately, obviously saving time if these alterations affect other parts not yet made.

Flying is the most difficult and discouraging stage. Probable damages will need repair. Changes and improvements to the design must be made to eliminate bugs which did not show up in earlier testing. Acquiring the coordination of controls required to fly even a good stable model helicopter will probably take longer than would learning to fly a real helicopter. Long life and reliability must be built into the model.

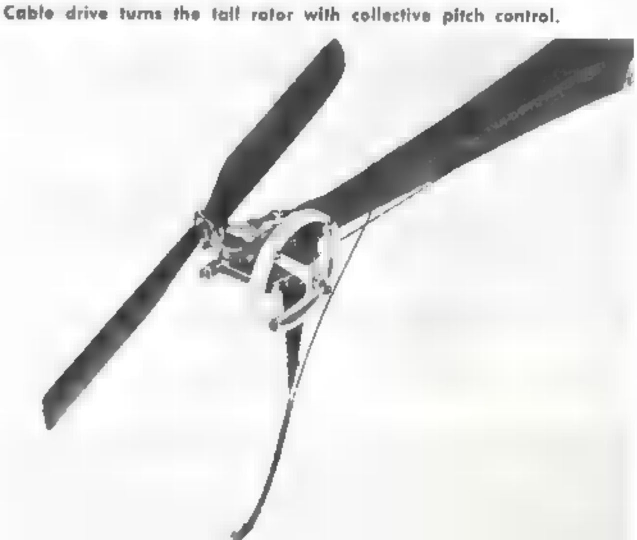
**Preliminary Design**

A detailed study of preliminary de-

One must know at what speed the engine puts out its maximum horsepower exactly as it will be used in the helicopter. This test rig gives relative power output, rpm measured by strobe.



Cable drive turns the tail rotor with collective pitch control.



sign begins with writing the specifications. The purpose of the model might be one or several of the following: (1) to build, with a minimum of construction and repair time, a small, simple trainer for learning to fly; (2) to set records in endurance, speed, altitude or distance; (3) to compete in RC scale events; (4) as an experiment to try out a new rotor system or [redacted] new configuration or any other special feature—a serious and valuable research tool; (5) to create an aerobatic helicopter, flying crane, etc.

Most people begin with the trainer. At this stage in the development of the art, the first one who can learn to fly a model helicopter then can proceed to set all five world records with the same helicopter. Later, when competition develops, specially-designed machines will be required to take the records.

At this point, the builder should eliminate conflicting requirements. For example, it would be foolish to build a scale model for learning how to fly because that means many crashes or hard landings. Scale means extra hours to build and to repair. A sensible compromise here would be to build a basic, compact machinery module containing everything but the tail boom. For training purposes, a simple straight tail boom and tail rotor can be added. For scale purposes, a scale tail boom can be substituted, and the boxy fuselage rounded out with foam plastic slabs carved to a scale exterior surface, then covered with fiberglass. Or, a fiberglass shell could be made on a male or female mold and attached to the machinery module.

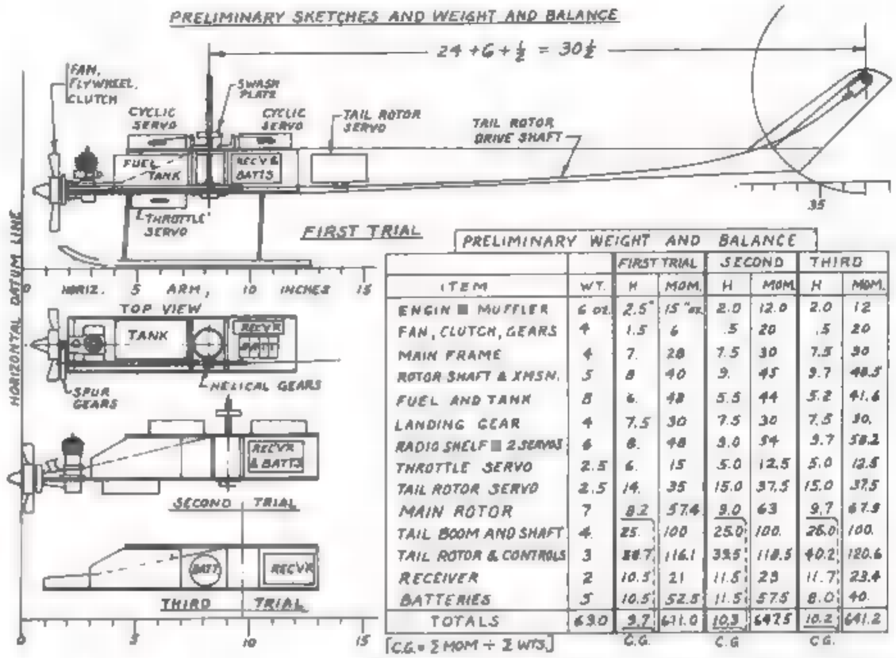
Once the purpose of the design has been determined, select the model's configuration. The most common are: single main rotor and tail rotor, geared coaxial (one rotor directly above the other), torque reactionless coaxial (or pinwheel) like most model helicopters built in the last twenty or thirty years, side-by-side twin rotor, or tandem rotor helicopter.

Most helicopters require some stability augmentation device. Flying an unstable model helicopter by radio control is humanly impossible. The time an unstable model takes to turn over is unbelievably short. Reaction time from eye to hand is around two-tenth of a second. The reaction time of most RC servos is on the order of half a second. Even without the servo time delay, a human pilot probably couldn't keep up with the gyrations of an unstable model, let alone anticipate or lead its motion by enough to damp out

**Data [redacted] weight/thrust, and engine displacement has been recorded since 1943.**

Table 1. Model Helicopters Represented on the Weight Trend Curve

| No | Gross Wt. | Max. Thrust | Rotor Dia. | Engine | Aircraft | Builder | Year |
|---|---|---|---|---|---|---|---|
| 1 | 5 oz. | 5 1/2 | 34" | .020 Cox Pee Wee | "High Time" | Burkam | 1966 |
| 2 | 25 oz. | 27 oz. | 36" | .049 Cox Tee Dee | "Susie Q" | Burkam | 1968 |
| 3 | 27 oz. | (?) | 50" | OS Max .10 R/C | "Cry Baby" | J. Carlson | 1968 |
| 4 | 3 lb(?) | 3 1/2 | 43" | .09 R/C Medallion | Rotor & Xmsn only | Burkam | 1967 |
| 5 | 4 1/2 | 4 lb | 48" | .60 Brown Jr. | Free Flight | Burkam | 1943 |
| 6 | - | 5 lb. | 48" | .60 Brown Jr. | Test Stand | Burkam | 1946 |
| 7 | 8 lb. | 15 lb. | 70" | .45 Veco R/C | XH-51A Design only | Burkam | 1965 |
| 8 | 9 lb. | 13 lb. | 64" | Super [redacted] Forster | Free Flight | Burkam | 1947 |
| 9 | 11 1/2oz | ? | 26" | .049 Cox Tee Dee | "Whirlbird" | D.L.Taylor | 1965 |
| 10 | 29 oz | ? | 36" | .19-.29 | "Chopper [redacted]" | Glen Lee | 1964 |
| 11 | 8 oz. | 13 oz. | 25" | .020 Cox Pee Wee | "Baby B" | Burkam | 1966 |
| 12 | 29 oz. | 32 oz. | [redacted]" | .049 Cox Tee Dee | "Super Susie" | Burkam | 1969 |
| 13 | 9 lb. | ? | 47 1/2" | G.60 Super Tigre | Sikorsky S-55 | Schluter | 1968 |
| 14 | 10 lb. | ? | 55" | .71 Super Tigre 263A | Hughes | Schluter | 1969 |




PRELIMINARY WEIGHT AND BALANCE

| ITEM | WT. | FIRST TRIAL H | FIRST TRIAL MOM. | SECOND H | SECOND MOM. | THIRD H | THIRD MOM. |
|---|---|---|---|---|---|---|---|
| ENGIN [redacted] MUFFLER | 6 oz. | 2.5" | 15 "oz. | 2.0 | 12.0 | 2.0 | 12 |
| FAN, CLUTCH, GEARS | 4 | 1.5 | 6 | .5 | 20 | .5 | 20 |
| MAIN FRAME | 4 | 7. | 28 | 7.5 | 30 | 7.5 | 30 |
| ROTOR SHAFT & XMSN. | 5 | 8 | 40 | 9. | 45 | 9.7 | 48.5 |
| FUEL AND TANK | 8 | 6. | 48 | 5.5 | 44 | 5.2 | 41.6 |
| LANDING GEAR | 4 | 7.5 | 30 | 7.5 | 30 | 7.5 | 30. |
| RADIO SHELF [redacted] 2 SERVOS | 6 | 8. | 48 | 9.0 | 54 | 9.7 | 58.2 |
| THROTTLE SERVO | 2.5 | 6. | 15 | 5.0 | 12.5 | 5.0 | 12.5 |
| TAIL ROTOR SERVO | 2.5 | 14. | 35 | 15.0 | 37.5 | 15.0 | 37.5 |
| MAIN ROTOR | 7 | 8.2 | 57.4 | 9.0 | 63 | 9.7 | 67.9 |
| TAIL BOOM AND SHAFT | 4. | 25. | 100 | 25.0 | 100. | 25.0 | 100. |
| TAIL ROTOR & CONTROLS | 3 | 38.7 | 116.1 | 39.5 | 118.5 | 40.2 | 120.6 |
| RECEIVER | 2 | 10.5 | 21 | 11.5 | 23 | 11.7 | 23.4 |
| BATTERIES | 5 | 10.5 | 52.5 | 11.5 | 57.5 | 8.0 | 40. |
| TOTALS | 63.0 | 9.7 C.G. | 611.0 | 10.3 C.G. | 647.5 | 10.2 C.G. | 641.2 |

[C.G. = Σ MOM ÷ Σ WTS.]

**In author's opinion, this arrangement of engine, rotor, and drive train is simplest and suitable. However, it is untried.**

**This chart relates only [redacted] gear-driven single rotor helicopters and is for .01 to .20 engines. Extrapolate for higher values.**

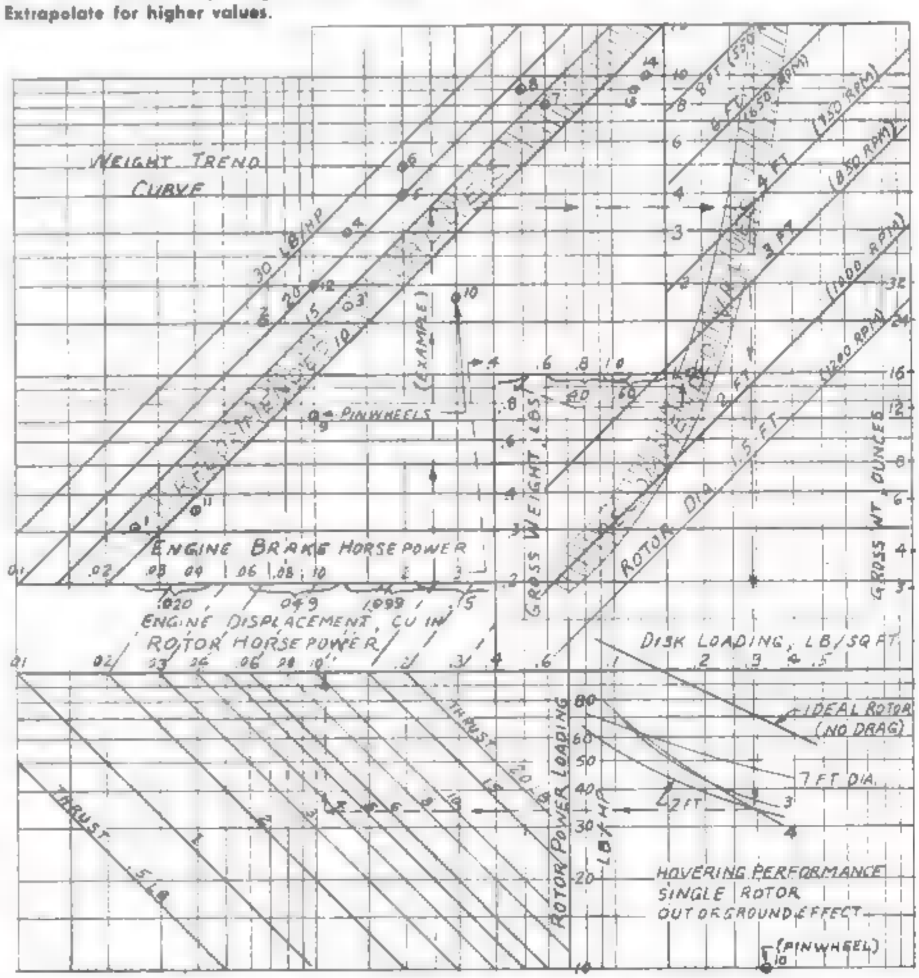
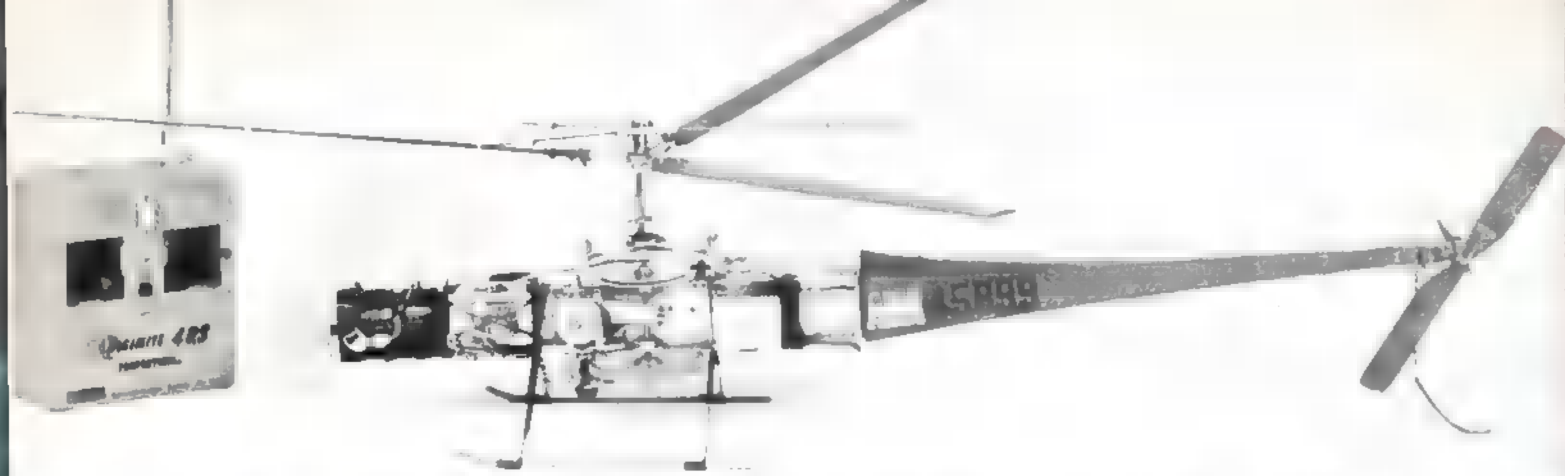



CHART FOR QUICK CALCULATION OF HELICOPTER SIZE FROM GIVEN ENGINE SIZE. START WITH ENGINE HORSEPOWER. GO UP TO CHOSEN POWER LOADING. GO RIGHT TO CHOSEN ROTOR DIAMETER, DOWN TO SAME ROTOR DIAMETER, THEN LEFT TO CHOSEN THRUST (OR GROSS WEIGHT). GO UP TO ROTOR HORSEPOWER THEN DIAGONALLY UP TO ENGINE POWER. IF YOU COME OUT TO THE LEFT OF WHERE YOU STARTED IT SHOULD GET OFF THE GROUND.



**Meet Super Susie. Using a Tee Dee 049 and four-channel radio, she has flown successfully quite often, and [redacted] held [redacted] world's record.**

or quiet down an oscillation.

Suffice it to say that all configurations, except single rotor, coaxial and pinwheel are extremely difficult to stabilize. On coaxial helicopters, the controls are rather difficult and complex. Pinwheels (the most common form of model helicopter) are far and away the simplest to build because they have no transmission. They are easy to stabilize with blade tip weights and servo tabs behind the blade tip. Other methods of stabilizing single rotor helicopters, such as Bell, Hiller and Lockheed, will work on pinwheels too. But they can't carry much weight for the power used. Ninety-five percent of the engine power goes into that small prop turning at high speed, yet it provides only about half the total lift. It would be interesting to [redacted] if a large model powered by a .40 to .61 cu. in. engine could carry a full proportional radio outfit.

Specifications usually include some indicator of size, such as "I want to build the smallest helicopter that can comfortably carry [redacted] four-servo proportional radio control outfit weighing 18 oz.," or perhaps, "I have this good .15 cu. in. RC engine. I wonder how big a model it would power." Those ideas will be used in the next step, preliminary performance estimation.

Before leaving specifications, a few niceties or good ideas should be kept in mind while designing the model. Among them are: (1) Exhaust gases and oil shall not spray over the model, but only [redacted] the gears. (2) All mechanisms, linkages, etc., must be easily accessible for repair, adjustment, replacement or modification. (3) Room must be left to install a larger engine and/or larger fuel tank. (4) Provision for autorotation of the helicopter in case of engine stoppage in flight is essential.

(5) No wood can be used for engine mounting or transmission structure because of the effect on it of vibration and oil soaking. (6) Gears must be open and occasionally lubricated or exhaust-lubricated, or gears shall be enclosed and oil- or grease-lubricated. (7) Tail rotor shall be shaft- and gear-driven, or tail rotor shall be belt-driven. Whatever the desired specifications, remember them during the designing.

The specifications used for the remainder of this article are as follows: (1) trainer helicopter with four controls; (2) single main rotor and tail rotor configuration; (3) as small and simple as possible and able to carry comfortably [redacted] quad proportional weighing up to 20 oz.; (4) long-life two-stage gear reduction, open gears in first stage, closed second stage; (5) shaft- and gear-driven tail rotor; (6) open, metal machinery module; (7) engine up front, pointing forward with cooling fan/flywheel and a spinner for easy electric starting, with exhaust spraying out to the side; (8) wide skid landing gear; (9) provisions for future modification to permit autorotation; (10) to be flown first as a free flight helicopter with throttle timer to partly close throttle for descent (add RC gear later); (11) inherently stable [redacted] item ten implies; (12) room for larger engine and/or fuel tank; (13) fuel capacity for 15 min. of hovering; (14) centrifugal clutch to allow starting without rotor turning.

**Preliminary Performance Calculations**

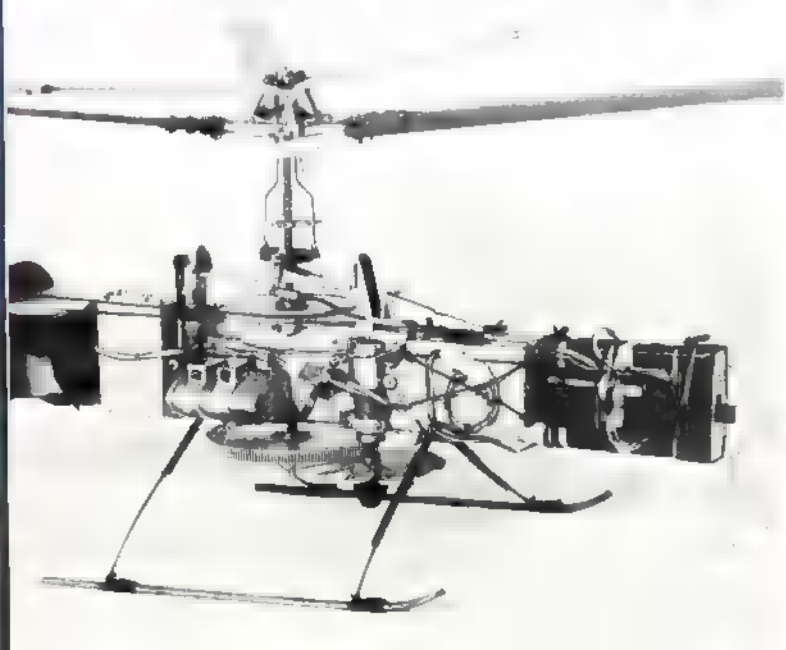
Now to use the handy chart (Fig. 1) which was first published in a paper given at the 1969 DC/RC Technical Symposium (Ref. 4) This nomograph is really four charts in one. The upper left chart relates engine brake horsepower, gross weight of model and gross power loading and shows the trend of power loadings of a dozen or so previously built (or designed) helicopters or rotors. Table 1 gives data on the fourteen examples. The upper right chart is another arithmetic calculation relating model weight, rotor diameter and disk loading.

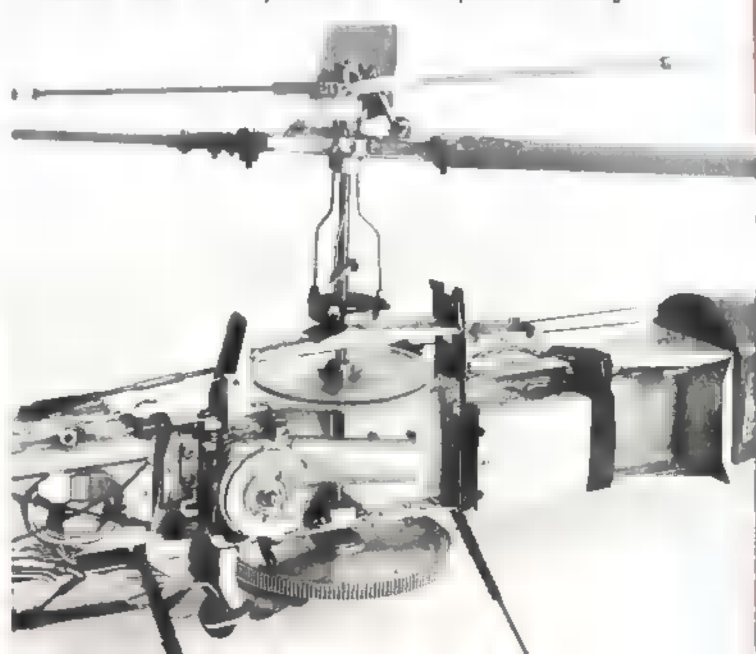
The lower right chart gives actual test results of four different model helicopter rotors in terms of rotor pounds per horsepower versus disk loading. This important information is difficult to obtain any other way than

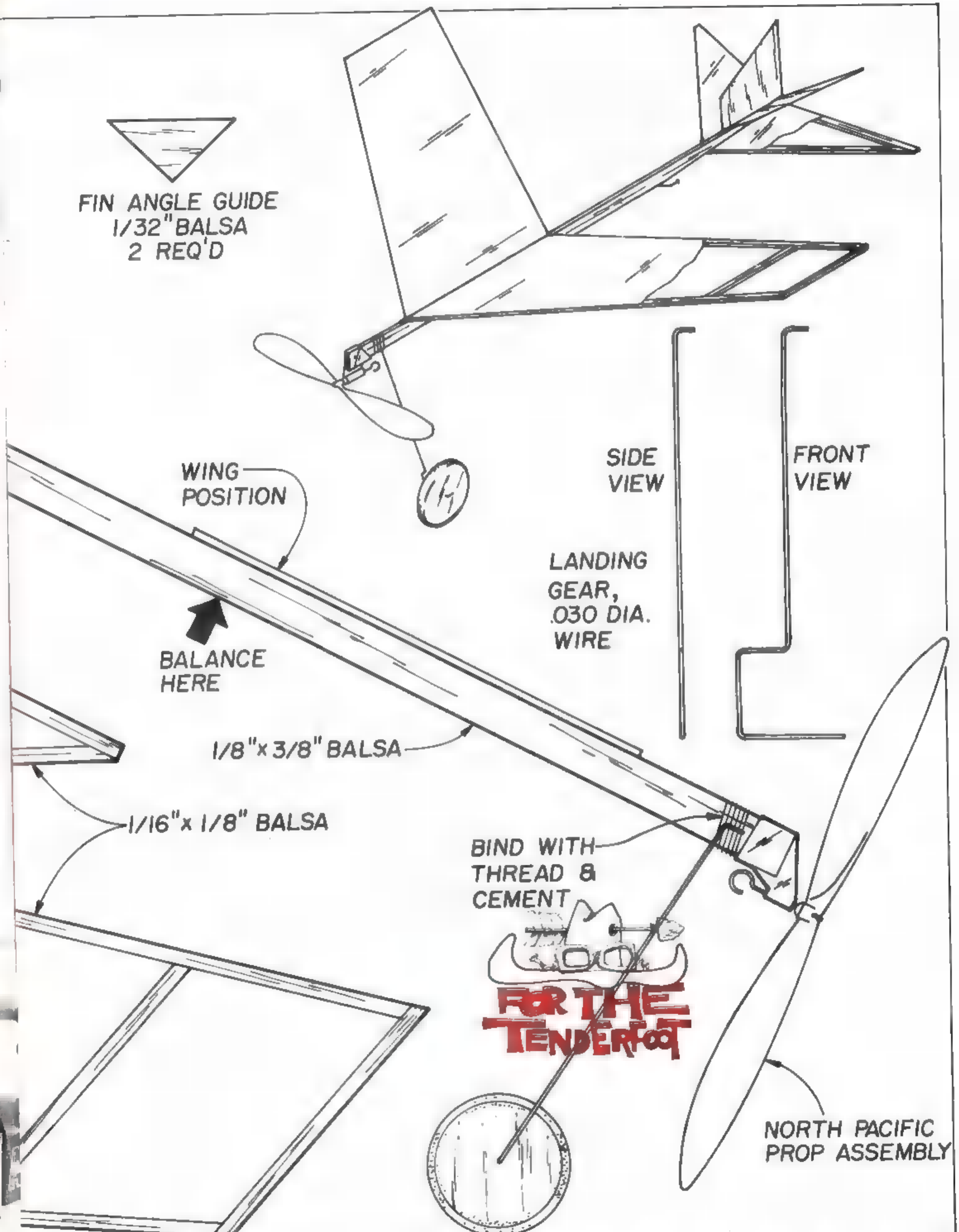
*(continued on page 63)*

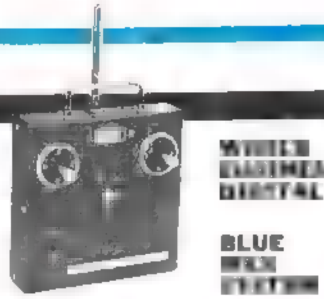
**As author emphasizes, efficiency, not brute power, produces flyable helicopters. First build something small and easily repaired.**

**Self-engaging, rather than centrifugal, clutch allows autorotation. Sufficient blade area is provided for [redacted] safe power-off landing.**






FIN ANGLE GUIDE
1/32" BALSA
2 REQ'D
WING POSITION
BALANCE HERE
1/8"x 3/8" BALSA
1/16"x 1/8" BALSA
SIDE VIEW
FRONT VIEW
LANDING GEAR, .030 DIA. WIRE
BIND WITH THREAD & CEMENT
FOR THE TENDERFOOT
NORTH PACIFIC PROP ASSEMBLY




# WORLD ENGINES DIGITAL

| DESCRIPTION | FACTORY ASSEMBLED | SEMI KIT | FULL KIT |
|---|---|---|---|
| 6 Ch. 4 servos | $330.00 | $280.00 | $245.00 |
| 5 Ch. 4 servos | 315.00 | 265.00 | 235.00 |
| 4 Ch. 4 servos | 300.[illegible] | 249.98 | 224.98 |
| 4 Ch. Tx w/Power Pak | 139.[illegible] | 114.98 | 99.98 |
| Add-A-Channel Tx (5-6) | — | | 6.98 |
| 6 Ch. Decoder + Receiver | 80.00 | 64.00 | 54.00 |
| 5 Ch. Decoder + Receiver | 76.00 | 61.00 | 51.50 |
| 4 Ch. Decoder + Receiver | 72.00 | 58.00 | 49.00 |
| Add-A-Channel Decoder | — | — | 3.98 |
| Rx Pak Charger | 7.98 | — | 5.98 |
| 6 Ch. Flite Pak 4 Ser. | 210.00 | 160.00 | 141.00 |
| 5 Ch. Flite Pak 4 Ser. | 205.00 | 155.00 | 138.00 |
| 4 Ch. Flite Pak 4 Ser. | 199.98 | 149.98 | 134.98 |
| Digit Migit 3 Ch. 1 Ser. | 109.98 | — | - |
| Digit Migit 1 Ch. | 69.00 | -- | -- |
| R S-4B Servo | 30.00 | 22.[illegible] | 18.98 |
| R S-4C Servo | 31.00 | 23.[illegible] | 19.98 |
| R S-4D Servo | 31.00 | 23.[illegible] | 19.98 |

## [illegible] NOTES

The RS-4C replaces the S-4, S-4A, S-3 servo and works with Controlaire, M.A.N., O.S. Digital Systems. The RS-[illegible] works with World Engines Blue Max Systems, Mule Digital, Digit Migit 3 Ch. and most other 4.8v center tap system decoders. The RS-4D is very similar to the RS-4C but is recommended for systems using SCS Decoders.

**Single Stick and 72 MHz**

Add $35.00 for 72 MHz and $25.00 for Single Stick Transmitter.

**Digit Migit Extra Channel**

Digit Migit 1 Channel up elevator [illegible] motor control servos at $30.00 each (Assembled only). You [illegible] use only one (not both) on the 1 Ch. system.

## [illegible] R/C EQUIPMENT

[illegible] Ch. Digital Propo w/2 servos and Rx nickel cadmium + Charger (assem.) $139.98

OS 3 Ch. Digital Propo w/3 servos and Tx and Rx nickel cadmium + Charger (assem.) $199.98

OS 4 Ch. Cougar Digital Propo w/4 servos and Rx nickel cadmium + Charger (assem.) $275.00

## SERVICE EXPERTS

The service experts listed [illegible] this advertisement are, for the most part, people who have been working with Digitrio and other kit systems [illegible] the various [illegible] mentioned. They have all put together an M.A.N. System from a raw kit and have agreed to stock parts that are compatible with World Engines Systems. They have been given schematics of World Engines Systems and current OS Digital Proportional Systems. Many of these service experts service other makes of equipment other than [illegible] own. Consider these people for repair work or for help in matching up our flight packs.

# WORLD ENGINES R/C
## RECOMMENDED SERVICE EXPERTS

### NORTH EAST

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**Ed Grening Jr.**
Rfd. 3 West Hill Rd.
Winsted, Conn. 06098
Tel. 203-482-6422

**MARYLAND**

**J. M. Lawrence, Jr.**
8451 Glendale [illegible].
Greenbelt, Md. 20770
*Repairs & modifications on all makes of Controlaire Equip.*

**NEW HAMPSHIRE**

**Dambrosi** Hobbies Inc.
58 Lake St.
Nashua, N.H. 03060
*Low, low prices on R/C equipment plus fast repair service.*

**NEW JERSEY**

**J. A. Deneke**
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Glen Rock, New Jersey 07452
*For same day service ship entire system with fully charged batteries.*

**PENN** Hobbies [illegible] Electronics
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Merchantville, New Jersey 08109
*Best quality service*
*All work guaranteed*
*Call 609-662-7717*

**RJL** Control Systems
P.O. Box 280
Denville, New Jersey 07834
*Assembled [illegible] Systems with service and crash ins. policy. Write for details.*

**NEW YORK**

**Andy's** Hobby
36 Main Street
Elmsford, N.Y. 10523

**VIRGINIA**

**R. E. Barnstead**
852 Lucas Creek
Newport News, Va. 23602
*Controlaire specialists*

[illegible] Electronic Model Shop
800 National Ave.
Winchester, Va. 22601
*Phone 703-667-1730*
*Complete sales and service Kits and equipment.*

### SOUTH EAST

**ALABAMA**

**[illegible] Deasy**
4020 Talwell Dr. S.W.
Huntsville, Ala. 35805
*Custom Built, test flown R/C Systems (Special Receiver)*

**FLORIDA**

**E. W. Bryant** R/C
Box 416
Punta Gorda, Fla. 33950
*We service all types of R/C gear—also build radio kits to your spec's.*

**SOUTH CAROLINA**

**S & R** Hobby Crafts
794 Piccadilly Drive
Charleston, S.C. 29407
Phone 803-795-1559

142 Camelot Drive
Camelot vill.
Hanahan, S.C. 29405
Phone 803-553-4890
*Charleston's only Digital Propo repair service at reasonable charges.*

**TENNESSEE**

**Aerotronics**
109 Chatham Lane
Oak Ridge, Tenn. 37830
*[illegible] C equipment—Service—repair—trade R/C problems? Free consultation and advice for beginners [illegible] experts.*

### MIDWEST

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**Stanton** Hobby Shop
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Chicago, Ill. 60630

**Walker's** Hobby Shoppe
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St. Charles, Ill.
*"Everything you need [illegible] Model Crafts". Kits, tools and raw materials. Experts in R/C.*

**Controlonics**
Karr Mfg. Div.
Box [illegible]
Thomasboro, Ill. 61878

**MICHIGAN**

**Gills** Hobby Supply
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Freeland, Mich. 48623
*Radio control specialists. Sales and expert service. Tel. 517-799-2532*

**J. H. Krauer**
22626 Petersburg
[illegible]. Detroit, Mich. 48021
*Service on all brands of R. C equipment quickly, efficiently.*

**Northern** Authorized Factory Service
6470 Washington
Stevensville, Mich. 49127
*Try us for FAST service by qualified engineers. Phone area 616-429-9926*

**MINNESOTA**

**[illegible] Schwartz**
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St. Paul, Minn. 55113

**MISSOURI**

**C. W. Reed**
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Raytown, Mo. 64133
*Contact Charley for quote on Controlaire and M.A.N. Systems and Supertigre Engines*

**OHIO**

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12450 Amity Rd.
Brookville, O. 45309
*4 mi. so. of Interstate 70 We repair most R. C equipment Gerald L. Peters, prop.*

**Town [illegible] Country** Hobbyland
55 Country Road
Columbus, O. 43213

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**Tulsa** R/C
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Tulsa, Oklahoma
*PH 836-5425*
*R/C Equipment Sales—FAST Service—Mail or Direct*

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San Angelo, Tex. 76901
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**ARIZONA**

**R/C** Engineering
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Phoenix, Ariz. 85013
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Los Osos, Calif. 93401
*You fly them & we'll fix them with the best R/C equipment G. E. Lyman Phone 528-1158*

**COLORADO**

[illegible] Electronics & Hobbies
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Arvada, Colorado 80002
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*Phone 303-424-4045*

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Forbes
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**Silver Star** Models
Mollebakken 45
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*R/C and model airplane specialists. Largest selection of R/C articles in Scandinavia*

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**World Engines** of England
M. J. Wilshere
97 Tudor Avenue
Watford, Herts

**GERMANY**

**Heinrich Haferland**
Hanover Herrenhausen
Morgensteinweg 8A, Germany

**JAPAN**

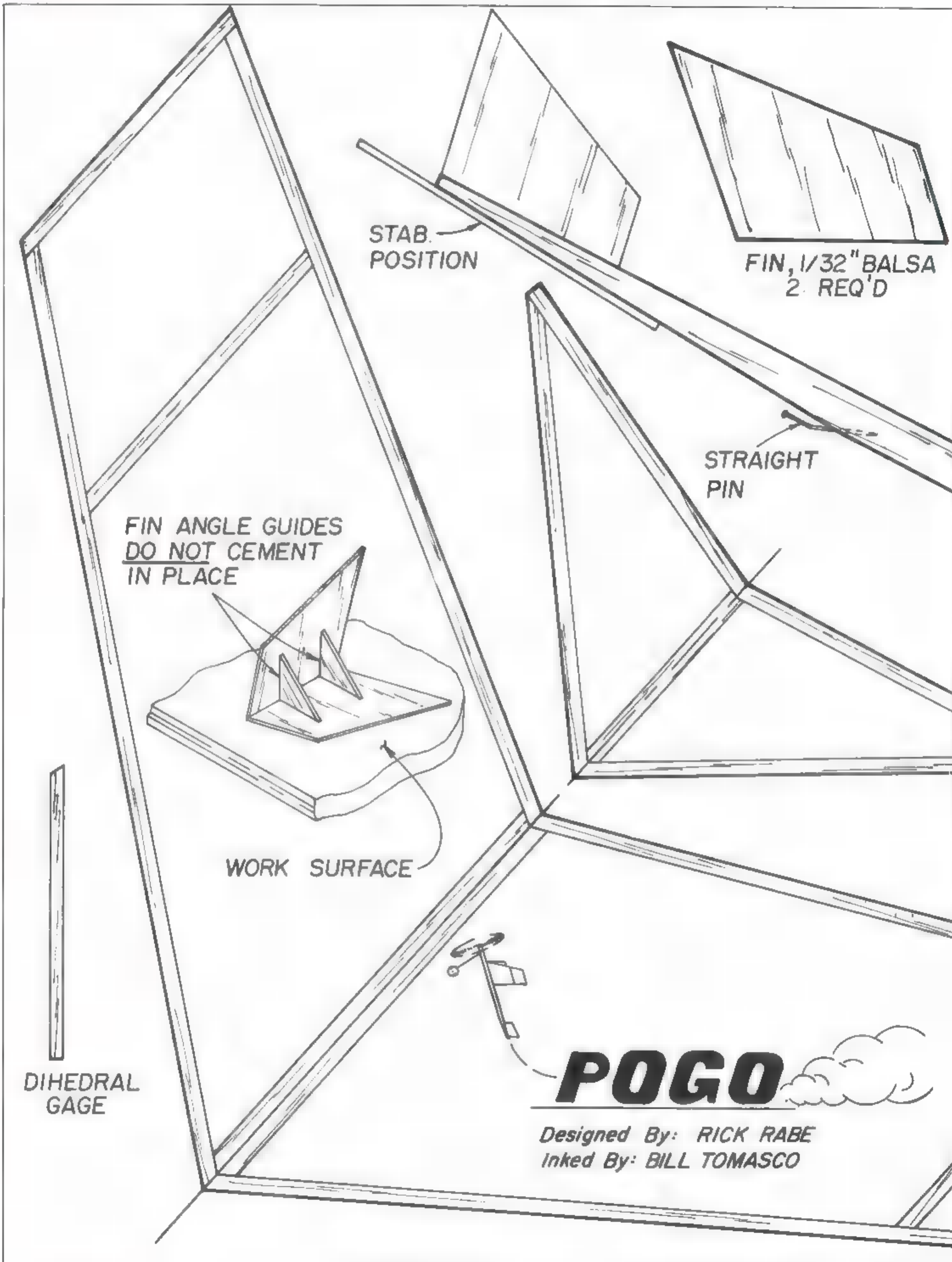
**Ogawa** Model Mfg. Co., Ltd.
83 Hiranobaba
Higashisumiyoshi
Osaka, Japan

**SOUTH AFRICA**

[illegible] McCullagh
Manie de Villiers Sport Ltd.
223 A Voortrekker Rd. Parow
Capetown, South Africa

# RPORATED, CINCINNATI, OHIO

Telephone 513-793-5900


STAB. POSITION
FIN, 1/32" BALSA 2 REQ'D
STRAIGHT PIN
FIN ANGLE GUIDES DO NOT CEMENT IN PLACE
WORK SURFACE
DIHEDRAL GAGE
POGO
Designed By: RICK RABE
Inked By: BILL TOMASCO

# THE AIRCRAFT MODELER AS SEEN BY...

# EKKO


Large canopy [redacted] carved balsa. It gives the model plenty of side [redacted] and storage space for large receivers [redacted] servos, [redacted] well as strengthening the [redacted] above the wing.

**Good aerobatic performance, functional, and realistic. This 40-powered compact fits in a VW.**

**HOH FANG-CHIUN**

NOT SO MANY YEARS AGO, multi-aerobatic flying was practicable only with large models because of the heavy and space-consuming radio equipment then in use. There was no choice but to construct a large aircraft in order to keep the wing loading at an acceptable level as well [redacted] to provide room for the bulky units.

Because of new mini RC systems, full-house aerobatic flying with more compact designs is now possible. Obviously, a smaller model is more economical to build and to operate. An added, and appreciated, advantage is the convenience in transportation, especially for those with VW's or similar autos.

Ekko is a fast, smooth-flying machine intended for serious aerobatic purposes. It does very pretty figures and handles the FAI pattern well. Good performance was the primary design consideration, but functionalism and a realistic appearance also were basic goals. Too often good designs have a rather unrealistic flat look. However, since such high levels of flight performance in aerobatic radio control flying have been reached, more attention should be devoted to the aircraft's appearance.

Ekko has a high degree of serviceability, even under field conditions. Built-in arrangements have been kept to a minimum in order to facilitate handling. The entire nose section is as functional as possible, because this is usually a trouble spot. For maximum accessibility, the engine is installed in an open and upright position. The fuel system, nose gear assembly, etc., are easily reached for inspection [redacted] adjustment through a removable hatch in the fuselage. The hatch is fastened to the compartment with two screws.

Ekko employs a straightforward and rapid construction system. Both the wing and horizontal tail feature a constant chord layout. A wing with swept leading edges may offer somewhat better flight characteristics but constant chord is used for simplicity and accuracy.

The particular shape of canopy used on this model [redacted] not available commercially and molding a plastic canopy [redacted] a tedious process. To simplify construction, balsa blocks were used instead. This type of canopy [redacted] solid than the molded ones. Strength here is of some importance because of the canopy's size.

Ekko's flight performance is comparable to the best [redacted] jobs. Design concepts follow general conventions but specific ideas from other aircraft influenced the final layout.

The model's most distinguishing feature is its deep fuselage which, in conjunction with [redacted] huge vertical tail, is especially valuable [redacted] knife-edge attitudes. The deep fuselage also is an asset in maneuvers such as Tail Slide and Figure M. The ability to maintain headings in some maneuvers is improved by the large fuselage side area.

From past experience, it is evident that excessive dihedral causes barreling in roll maneuvers. On the other hand, a flat wing has poor stability in the lateral plane. For [redacted] satisfactory compromise, the dihedral [redacted] made about two degrees on each wing panel. This amount of dihedral, combined with [redacted] fairly short and stubby wing, makes constant on-the-wire rolls possible.

The full symmetrical wing section was selected because it is unequaled in inverted flight positions. This airfoil also seems to provide better grooving quality, especially under turbulent conditions.

Ekko has a 50-in. wingspan and its wing area is 460 sq. in. A suitable powerplant is a 23 to 40 engine. A 23 is about as small as is practical. With this engine size, the model should be docile, but vertical maneuvers might be difficult to execute.

A 35 is about the best engine. It develops enough power to pull the machine safely through the entire schedule, yet at level flights the speed is not excessive. Above 35, the model would be something of a speed demon, probably more suitable for racing work (Open Pylon) than for precision aerobatics.

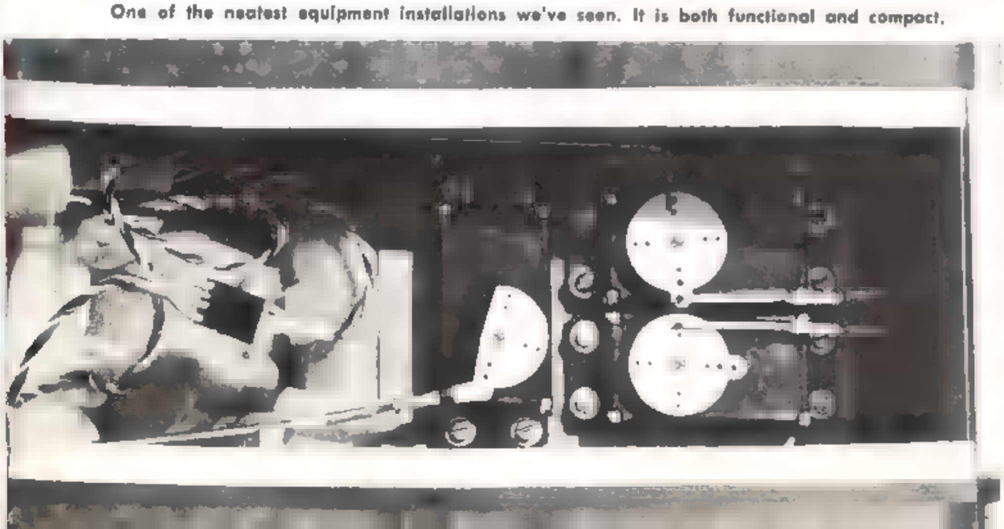
The prototype was powered by a Supertigre 35. The radio outfit was a K.O. Digiace four-channel digital proportional. With this installation, the all-up weight was approximately $4\frac{1}{2}$ lb., which is a little [redacted] the heavy side. It is best not to exceed 4.25 lb.

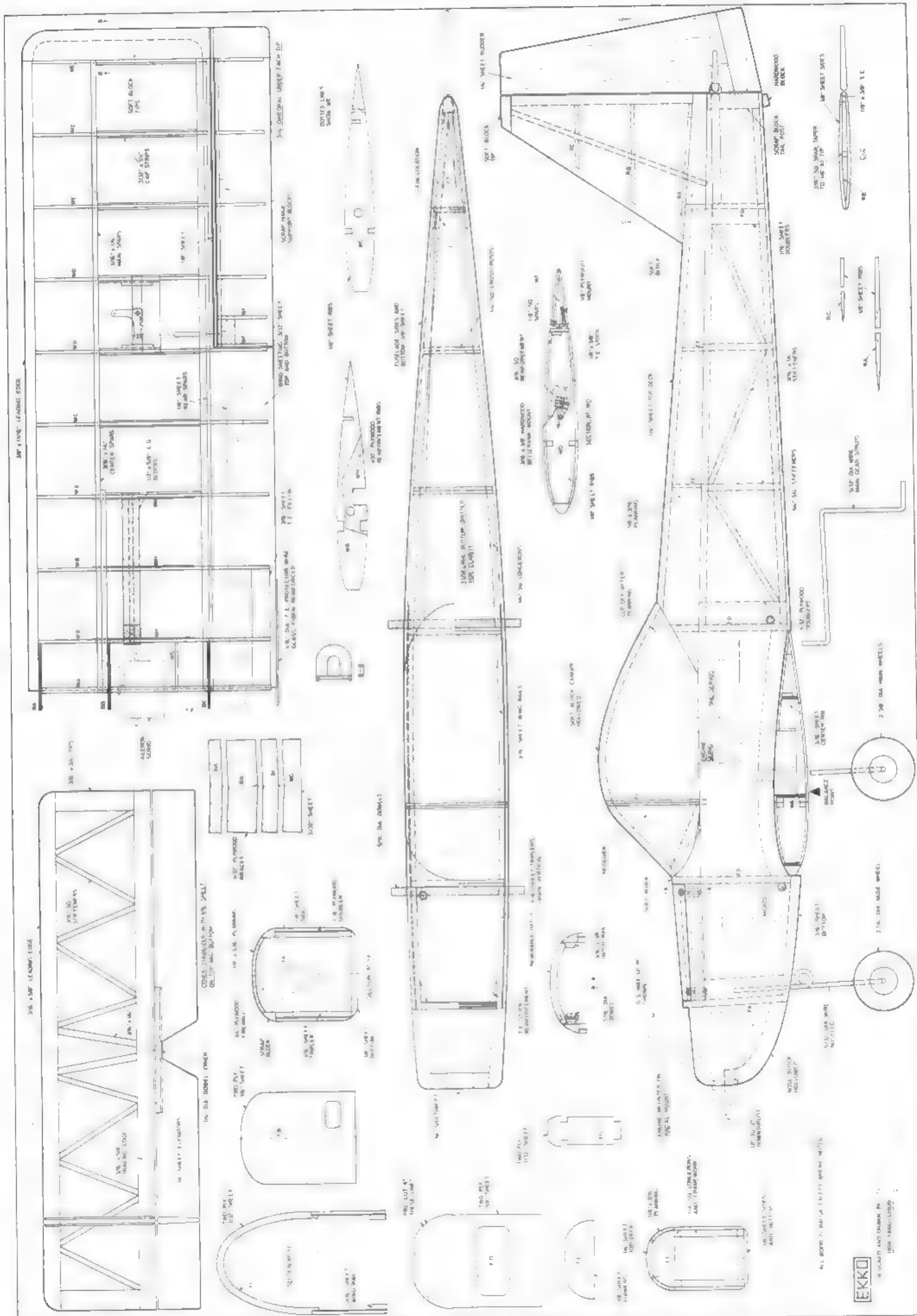
The materials specified are intentionally on the large side because it is more convenient and rewarding to work with

*(Continued on page 86)*

Ekko, with a 35 engine, K.O. Digiace radio, at $4\frac{1}{2}$ lb., flies like [redacted] 60-powered stunter.


One of the neatest equipment installations we've seen. It is both functional and compact.





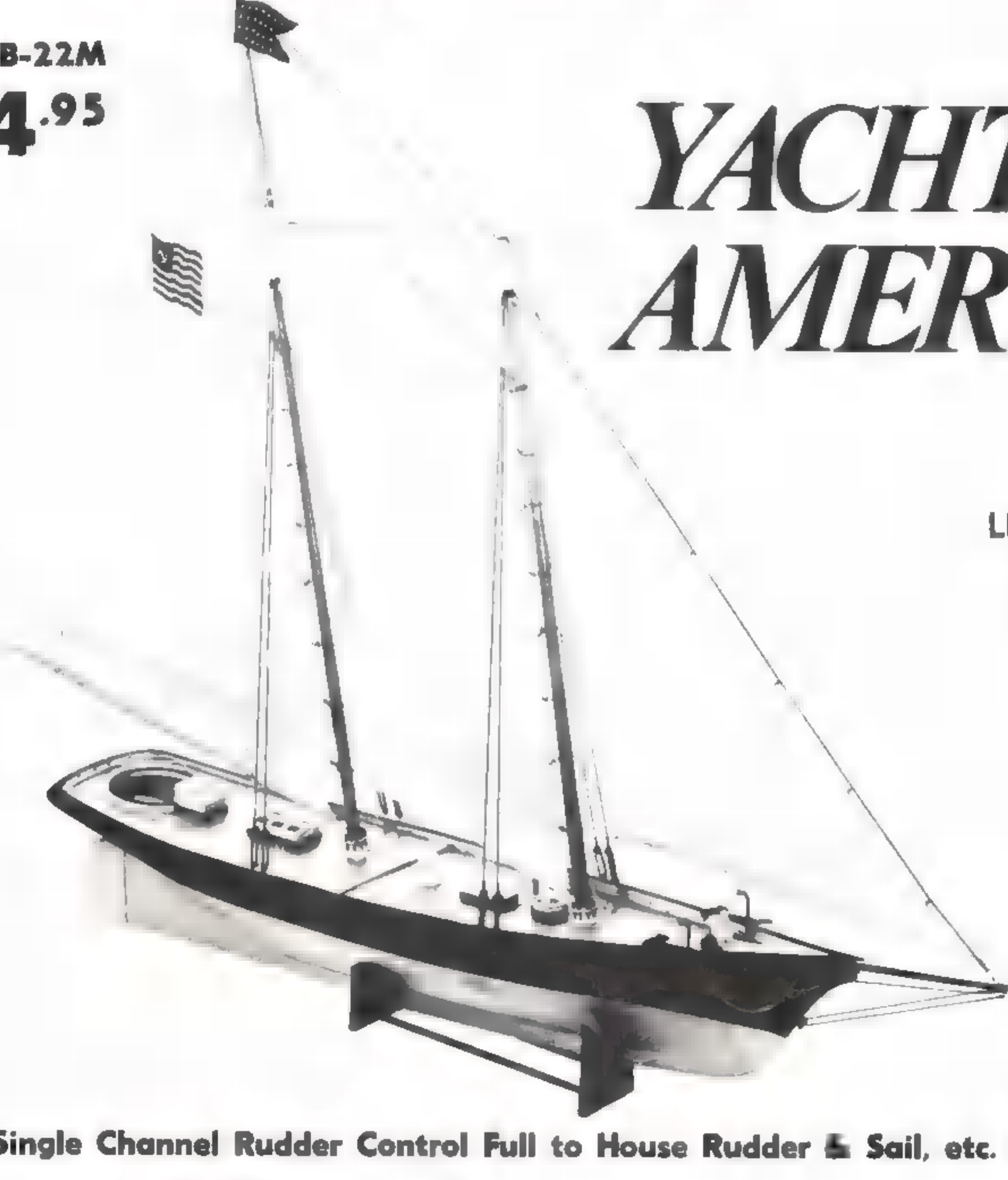
FULL SIZE PLANS AVAILABLE—SEE PAGE 70

# IN THE WATER!

KIT B-22M

**34.95**

# YACHT AMERICA



LENGTH: 51½"
HEIGHT: 41"
BEAM: 8½"

## Single Channel Rudder Control Full to House Rudder & Sail, etc. Operation

### *A FINE OPERATING SAILING MODEL . . .*

This magnificent model is a true scale replica of the YACHT AMERICA as it was rigged between 1851 and 1859. Designed by George Steers, and built by W. H. Brown of New York, it was launched May 3, 1851. At 170 tons, it was 95'6" long, 23' beam and had an 11'6" draught. In June, the AMERICA sailed across the Atlantic to accept the challenge of the British Royal Yacht Club to a race around the Isle of Wight. The victor would win the Hundred Guinea Cup, which is now known as The America's Cup. The win of the race around the Isle of Wight started The America's Cup Races which has been successfully defended by American vessels for over 100 years. The AMERICA served both sides with distinction in the Civil War. It was destroyed in a collapse of a protective shed in 1944. Kit features accurately die cut Balsa and imported Birch plywood that makes assembly relatively easy for most anyone. Other features are: • Die-Cut Birch Plywood Decks with planking grooves printed in • Tapered Masts, Booms, Spars, etc. • Miniature Rope in scale size and color • Fine quality Sail Cloth • Chain • Dozens of exquisitely detailed Cast Metal Fittings, as well as Hardware and Special Metal Fittings for rigging • Simple step-by-step Plans showing all phases of construction and operation.

*. . . MAGNIFICENT IN THE WATER OR ON THE MANTEL*

# AMA News Bits

### Formula I Racers—Fast!

The two known RC Speed models which were to try for the FAI RC Straight Line Speed World Record (presently 198.8 mph) were both scratched before the Labor Day weekend World Record Trials organized by the **AMA chartered D.C. Radio Control Club. Maynard Hill's** elevator servo apparently failed at which might have been a speed in the area of 180 mph. And the contender by the **Bob Violett/Cliff Telford** team had its wing shed at high speed during a practice flight the week before. But since the speed traps were already set up and operable, **Joe Solko** decided to give the timers some practice—his Pylon plane tracking smoothly through at about 120 mph. Then the Violett/Telford team decided to find out just how fast their Formula I was going—that turned out to be 163 mph! The only real successful note of the weekend was Maynard Hill's altitude record which has been reported previously. Thanks to the **DCRC Newsletter** for this information.

### New Navy Carrier

The pictured **USS Kingsville** (CVT-70) was commissioned specially for the AMA **sanctioned First Annual South Texas Regional Meet** held this summer at the Kingsville Naval Air Station in Texas. Sponsor for the big meet, which included a wide array of Radio Control and Control Line events, was **Training Squadron Twenty-Three** (VT-23). Proceeds were donated to the **Navy Relief Society.**


U.S. Navy photo

The Second Annual in 1971 is tentatively planned for the Memorial Day weekend. Let's give a big round of applause to the U.S. Navy for its assistance with airplane modeling events locally, regionally and nationally. Did you know that the U.S. Navy has been host to the **National Model Airplane Championships** every year since 1948?

### Only for Show

Picture this. A shiny Kwik Fli III is brought out on the flight line by ■ flyer and his 12-year-old daughter, and the engine is started. Now, while the starting battery is being returned to the field box, the daughter grabs the transmitter, revs-up the engine and takes off! The dad, seeing this, runs to his daughter for the transmitter, but she's not about to give it up. He finally gets the box away from her, but then the plane begins making wild gyrations and nearly crashes. Showing his temper, dad throws the transmitter to the ground. What does the daughter do? She retrieves the box and makes ■ perfect landing!

This whole sequence was ■ staged part of demonstration flying during the **Omahawks 16th Annual RC Contest.** The participants were **Ollie Ohlson** and daughter. According to **Denny Purduski** in **Feedback**, newsletter of the **AMA chartered Shawnee Mission RC Club,** Kansas, "I must say you were wondering for awhile."

### New West Coast FF Nats

Revision of the dates for what was first announced ■ the FF Winternationals (Jan. "AMA News Bits") to Memorial Day weekend, May 29-31, has resulted in renaming the big meet the **West Coast FF Nationals.** Taft remains the site. At this later date, northern California clubs will be able to assist with the operations, there is a probability for better weather, the three-day period better suits the wide array of events, and more advance time will be available for detailed planning. Official flights will be made by the system of "time one, fly one". All indications are that the top West Coast FF talent is pitching in to make this ■ excellent affair.

### Nearly Toledo Time

The premier RC show of the year, the **1971 Toedo RC Conference,** will take place on February 27 and 28. In addition to displays, exhibitions and festivities which have made the conference famous, this year's program is expected to include a clinic ■ RC Pattern judging. Set your sights ■ Toledo, Ohio. More details from the **AMA chartered Weak Signals Club,** Box 5772, Wernert Stn., Toledo, Ohio 43613.

### Good Deed

Melson Hall photo

Photograph shows **Bob Underwood,** microphone in hand, presenting a $135 check to **Wayne Kennedy,** Commissioner of the St. Louis County Department of Parks and Recreation. This was a contribution by the **Greater St. Louis Modeling Assn.** to the **Missouri Park Board Scholarship Fund** which is designed to help students (who are studying in park administration or recreation) in two state-supported colleges. Occasion for the ceremony was the **1910 RC Air Race** at Buder Park, St. Louis.

### 60,000 See RC Exhibit

That's a lot of people, but according to **Feedback,** newsletter of the **AMA chartered Shawnee Mission RC Club,** Kansas, that's how many were present at the Annual Open House at **Richards Gebauer Air Force Base** when club members presented a combination RC flying static display as "Operation Handshake". Participating club members were **Ed Choafstal, Jeff Taylor, Bruce Perkins, Ken Wilson, Steve Rice, Larry Klusman, Dave Ellis, Ed Vollmer, Richard Bowdish, Bob Merrill, Virgil Smith, Ron Sims, Red Sims, George Schultz, Less Freund** and **Denny Purduski.**

### FF for the Pigs

**George Perryman's** unique polydihedral stabilizer models are not only extremely flyable, but they must also be edible according to a story in **Air-Foiler,** newsletter of the **AMA chartered Coffee Airfoilers MAC,** Tullahoma, Tenn. George was putting together his usual long string of maxes with his "Little Daddy" rubber model at the club's Free Flight Contest last August when the model mysteriously vanished. "The model was seen to DT; however, when George arrived at the spot where the model went down, there wasn't ■ trace of it." Even when others joined in the search, the model still was not to be found until, finally, **Brian Webster** looked into a nearby pig pen. "There, in the mud, were a few scraps of steel attached to a well chewed nose block, all that remained after the pigs finished their mid-afternoon snack."

### Pattern Handicap

The closed club contest of the **AMA chartered Fresno Radio Modelers** (Calif.) last November was important because the score each entrant attained was the basis for determining ■ handicap which would be applied at future contests. Some pretty tough maneuvers were included in the special pattern for determining the handicap, but **John DeProspero** said in the club's paper, **Watts New,** to cross out any maneuver the member feels he can't do. "This will not give you a poor contest score," he said, "because the maneuver crossed out will be replaced by handicap points, up to 15% of the top flyer."

### AMA Film Library

Through the years, and especially during the past few, AMA HQ has acquired a number of motion pictures for loan principally to AMA chartered clubs. Of the 12 films currently available, some are 16 mm and some are Super 8. Film lengths range from about 12 minutes to 45. Many of the recent films show scenes from the **National Model Airplane Championships,** while the earlier films are of the **Plymouth Internationals.** The handling fee for each film loaned is only $2 (also requires an extra $5 deposit which is refunded). AMA chartered clubs have first priority on use of most films.

Full details on the **Film Library** should be requested from AMA HQ, 806 Fifteenth St., N.W., Washington, D.C. 20005. Send a pre-addressed, stamped return envelope; and if your club is not already AMA chartered, ask for free club charter information.

**Fly Safely!**
**Follow AMA Rules**

They're NEW! They're GREAT!
FINE MODEL ACCESSORIES
Sterling Nylon Fittings are manufactured from pure virgin nylon. Nylon used is the most solvent resistant type and is insoluble in common acids, oils, greases, etc. Molded to exact specifications, these Fittings are tough and extremely durable. The use of Sterling Nylon Fittings on Radio Control Models is highly desirable, since it elimin- electrical noises.
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PHILA., PA. 19144, USA
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#6 NYLON SCREWS
35¢
#101 4 - 10/32 x 1"
#10 NYLON SCREWS
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#102 4 - 1/4-20 x 1"
1/4" NYLON SCREWS
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1/4" NYLON SCREWS
59¢
#104 Set of 2
AILERON BELLCRANKS
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THRUST WEDGES
45¢
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DRILL SECOND HOLE TO SUIT ENGINE
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CONTROL HORN & PLATE
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#113
NOSE GEAR STRUT
49¢
#115 One Pair — Left Right
STRIP AILERON LINK
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STEERABLE NOSE
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MODEL AVIATION
Official magazine

A.M.A. NEWS

AMA

Academy of Model Aeronautics [redacted] 806 Fifteenth Street N.W., Washington, DC 20005

INTERESTED IN JOINING A.M.A.? Over 32,000 did in 1970. Membership details may be had by requesting FREE BROCHURE from above address.

# What Made the '70 Nats so Great

It's [redacted] matter of history now—**the 1970 Nats was the best run [redacted]** The verdict has come from the model press in all its forms: magazines, newspapers, newsletters. It's obvious now that this Nats was something special. Here's [redacted] report on what made it so great.

Basically, it has to do with people. The best planning in the world isn't enough for success—the right combination of people [redacted] needed to serve [redacted] officials and make the planning work. And it's not only [redacted] matter of competence—the people have to be compatible.

We've had other Nats where some technically competent officials didn't work well with each other so that frictions developed and prevented good coordination and cooperation. The 1970 Nats had the happiest combination of people yet—no easy accomplishment when so many officials are involved.

The record shows that there were over one hundred officials serving in major positions at this Nats—more officials than ever before. In addition to these key people there were many others who were assistants or helpers—important personnel who made the jobs easier for everybody.

The numbers alone made the operation complicated and tough to control, and there were also factors of time and distance to cause more problems. Besides sheer size of the operation (42 events spread over seven days) most of the people were from different parts of the country who assembled only [redacted] day or two before their events took place.

Many of the pictures in the AMA Film Library [redacted] produced by John Clemens, newly elected AMA president, Nats Air Show Director.

Fortunately most were Nats veterans who had proved their ability to adapt quickly and share responsibility with others. Prior to assembling this crew of officials, experiences of past Nats operations had been sifted to determine those who had performed best. These people were then asked to carefully select their own helpers. On the whole that procedure worked well, except where [redacted] people were unavailable.

In the end it was the subsitutions for first choices that made the planning work as intended. There was some luck here in that some new and untested people fit into the operation beautifully. But mainly it was the effort to carefully select people, rather than grab the first volunteers, that made the difference. Too many times in the past, eagerness or simple availability was substituted for proved capability. The 1970 Nats [redacted] more successful in avoiding this kind of situation.

Whether by luck or better judgment, some of the [redacted] people among Nats workers did [redacted] great job. Take [redacted] **Robinson** in **Free Flight**, for example. He was a last-minute substitution, without previous Nats experience. He and **Charlie Danila**, another newcomer, worked well together. So did **Jack Florenzie** and **Bernie Shulman.**

This Nats crew of officials produced the smoothest running Free Flight operation in many years. That they were able to do so was also due to a new operational concept. In past years the Nats FF events were plagued with one-day workers—people who were there mainly to fly but willing to work a day or two. The effort was appreciated but it didn't really work very well—just as one official would learn his job, someone else would take over.

This year, however, the FF officials worked all week long. There were two for power events, two for non-power. For the first time in many years we had continuity to back up competence. It paid off in many ways—not only did the officials learn and improve from day to day, they also got to know their Navy helpers and worked more effectively with them.

**RC Pylon** was another area where several substitutes did [redacted] great job for originally chosen officials who were unable to make it to the Nats. Event Director **Glen Spickler** came up with other people who were new to the Nats operation but well proved workers in other meets. Under the joint leadership of Glen and his assistant, **Jack Fabbri**, the

Silver helmet worn by Ron Morgan, above, designated top official's echelon. Morgan was Contest Manager while Earl Witt, below, took the Contest Director post. Both Nats vets.

Kemp Bunting, above, [redacted] the RC Category Director, ably administered time share system. FF's Pete Sotich, below, in timer briefing.

new team produced the best Nats Pylon event yet.

Here again the blend of AMA and Navy workers was a big factor. The officials did a good job of briefing the Navy personnel and worked closely with them throughout the meet. The teamwork was highly effective, proving the point that how people work together is as important as how skilled they may be individually. In the pressure of competition, long hours, and hot weather, the ability of all involved to work without conflict made the job easier and the contestants happier—despite many minor crises and anxious moments during some of the closest races ever held, tempers stayed cool and spirits high.

**RC Pattern and Scale** also had excellent teams of officials—mostly the same people for both events. Nats vet **Bob Scott**, for Pattern, and **Don Lindley**, for Scale, coordinated closely under the leadership of RC Category Director **Kemp Bunting** to make the new concept of time and frequency-sharing work—this was the first Nats in which both events were run simultaneously. Nats RC Manager **Ed Shipe** had proposed the concept, confident that with teamwork and coordination it would work.

The net result was more flights than would otherwise be possible, highly desirable since more flying opportunities is the sure key to contestant happiness. The concept was new but had long before been proven feasible through exhaustive studies by Bunting, who spent many hours before the Nats working out detailed analyses of various sharing combinations. The homework really paid off in terms of maximum flying with minimum griping.

Even in **AMA Headquarters**, usually the most frantic operation at the Nats, this was the smoothest Nats. For once there was enough help, both in volunteers and in regular workers from the staff in Washington. **Betty Stream** and **Judy Rankin** were the volunteers, from opposite ends of the country, and they worked well during long hours together to augment the basic HQ crew.

The **Nats Tabulation** operation was another behind-the-scenes success story. **Cliff Piper** was again the boss, as he has been for many years, with enough help this time to do the job well—for too many years the operation had been under-staffed. Cliff hand-picked a crew of old and new Nats workers and also had a full complement of Navy assistants. They worked many long hours into the night verifying daily event standings, scoring championship points, and producing a 60-page Nats results booklet that was available for model press distribution by 6 p.m. on the last day of the meet.

On the field, **RC Tabulators Pat Kendall, Lee Ann Smith** and **Jim Bachelor** kept up with the complexities of Pattern and Scale scoring. AMA Scale has the most complex scoring system ever devised for modeling competition, and FAI Pattern (AMA Class D) is complicated by "K" factors. The RC field crew, however, knew their jobs and had good Navy help to ease the load; even though much more flying than usual was going on they kept up and stayed cheerful.

In **Control Line, Gosta Johnson** was Category Director (also AMA Vice-President for District VI), backed up by Nats Executive Committeeman **Pete Peters** as Category Manager. They put together a combination of Nats veterans and newcomers; most of the latter from the Chicago area. It was a good blend of experience and enthusiasm, also a good mixture of people from far and near.

Besides having some tough events to run, some with huge entry lists, the Control Line operation had some serious health problems behind the scenes. **Gosta Johnson** came out of the hospital just before the Nats, still very weak and recuperating in the midst of the Nats. Similary, Rat Race Director **Whalon Webb** (also District VI Contest Coordinator) had been very sick just before the Nats. At first the Nats operation perked him up and made him feel better, but after a couple of days in the hot sun he had a relapse, and substitutes had to take over.

The Control Line events kept running despite all kinds of problems like this. FF and RC problems were mainly due to large numbers of contestants, but CL had these plus added headaches of equipment troubles (stopwatch failures, for example), controversial rules interpretation decisions, crowd handling and model processing problems. All added up to a hectic Control Line week but one in which many hundreds of flights were flown successfully despite a constant stream of difficulties. It took a lot of talent to cope with all that, but the talent was there largely due to good advance work in selecting officials who knew their jobs.

The **Indoor** events this year also had an outstanding crew—**Bud Tenny** and **Jim Perdue** backed each other up on two days of intensive flying. The air was so good in the Washington Park Armory that contestants flew constantly in contrast to the usual Nats pattern in which the activities didn't get going good until late afternoon. A common comment heard about Indoor was that there seemed to be more models in the air at all times than ever before—at one time that somebody took the trouble to count, there were 14 microfilm models flying at once.

Bud, Jim, and also **Ralph Kuenz**—who ran a very popular **Indoor Scale** group of events—were kept going steadily during the longest days at the Nats. It was a 9 a.m. to 9 p.m. stretch of duty, plus a couple of hours more of work both before and after the events—a really tough couple of days for the Indoor officials, their helpers, and one of the best crews of Navy timers ever. It might have been a quiet couple of days in Indoor, but it was also a pair of the busiest.

**Scale** fans got a new deal this year and for most it was one of the best Nats to date. Scale Director **Clark Macomber** worked behind the scenes at several past Nats and had come to the conclusion that some major improvements in procedure were needed. He spent many long hours before the Nats working to solve past problems and came up with many ideas about how to do a better job of judging and scoring.

In taking over the top job in Scale, Clark recruited a nine-man team of officials to work with him. They not only static-judged all models (a back-breaking job, with over 150 entered in the Scale events), they also ran the flying end of the FF and CL Scale events and helped flight judge the RC Scale event. The end result was that the Scale events—always a source of Nats controversy since so many judgment factors are involved—had fewer complaints than have been heard for many years.

Not only did Macomber and his crew do a good job of running the Scale events, they also led an effort which resulted in Scale being recognized as a new official Contest Board category—an


At the Rat Race circle Whalon Webb, left, used both flag and megaphone to give out instructions over the roar of screaming engines. Giving another look at Donald Neill's fine RC AT-6 is Clark Macomber, center, Scale Director. He designed new judging form, a boon to his crew. Right, check-weighing Dale Wilson's Wakefield is Jack Florenzie, non-power FF co-director.

Big behind-the-scenes job of flight tabulation [redacted] directed by Cliff Piper, above left, standing. Don Jehlik, center photo above, directed CL Stunt. Upper right, RC Category Manager Ed Shipe (helmeted) and Jerry Kleinknight, Pylon Race starter. Field telephone in [redacted] by Murry Frank, Combat Director, lower left; also shown is Gosta Johnson, CL Category Director. Below center, Bud Tenny directed Indoor events, later assisted in tabulation. Familiar face at CL Speed circles was Director John Smith, lower right, checking a pilot for "whipping."

upgrading that Scale fans have been after for many years. The AMA Executive Council listened to and observed Clark's Nats efforts for several months prior and were impressed sufficiently to vote full Contest Board status at the Nats council meeting.

**RC Judging** at a Nats is much more of a chore than at other meets. There are more contestants, more flying hours. There is also more pressure, because there are more top flyers involved than at any other meet, so the standards of performance are exceptionally high—making it tougher to sort out the winners since the differences are very small. Also, coordinating the activities of four sets of judges operating simultaneously (four flight lines) is a tougher task.

Again in 1970, as for the past several years, **Bill Northrop** (also AMA's RC Contest Board chairman) took on the task of not only directing the judging operation, but also the advance recruiting of volunteer judges. Once more it was a blend of Nats vets and newcomers that was produced—24 people for for this effort alone, almost as many civilians as were used for the rest of the RC operation.

Because of the numbers required, the RC judging operation [redacted] changed several years ago from a military to a civilian operation, thus greatly relieving [redacted] critical Navy manpower problem—particularly since Navy pilots were previously involved and these were hard to divert from duty assignments. A similar problem exists in **CL Stunt** judging, but the numbers are fewer so Navy personnel are still used. Event Director **Don Jehlik** did [redacted] outstanding job of training the 1970 CL judges, so much so that some Navy personnel said that it was equal to or better than any military training they had received.

Comparing categories provides [redacted] interesting contrasts. In FF Outdoor, for example, there were [redacted] total of seven civilian officials, working with 70 Navy personnel (mostly timers). In CL, there were 14 civilian officials and 21 Navy personnel. In RC there were 22 civilian officials, 24 civilian judges and 26 Navy personnel.

There were many more Glenview Naval Air Station personnel involved in the Nats than indicated here, both military and civilian. Not only did the Navy provide many people to help operate the Nats—over 100 with specific Nats assignments—but they also had to continue basic station operation: security, maintenance, cleanup, medical, clerical, reproduction, and many other behind-the-scenes duties necessary to keep the station functioning, even [redacted] a reduced level. In addition the Navy flew in many specialist personnel to assist with Nats promotion—Navy journalists and photographers came from several other stations to assist Glenview personnel in reporting and publicizing the Nats. The total number of Navy people involved equalled [redacted] exceeded that of the AMA people. **There's no doubt about one point—as good as our people were we could not have done the job without the great Navy help that was made available to us.**

There were actually [redacted] total of 73 AMA officials, plus twenty-four civilian judges, a HQ staff of eight, many miscellaneous assistants. Among them were eight in the Jr. Program alone (with about 40 part-time volunteer helpers), six in the Nats Hobby Shop, six in the HQ tabulation unit, plus others who handled photography, PR, and trophy chores. Actually there is no truly complete accounting since so many people simply pitched in and helped without specific assignments. Those that are known to have helped are listed, with apologies and thanks to many more whose names got overlooked.

For every name listed there [redacted] similar stories of dedication and sacrifice that can be told. The most obvious is that each person could have been flying in the Nats rather than working to help others fly. Hopefully the satisfaction that each derived from knowing that his or her part of the effort helped make this Nats the world's greatest model meet, will last for many months or years and provide the inspiration to volunteers to serve again.

## Nats Officials

### Contest Manager

**Ron Morgan**, Scotland, Pa.

### Contest Director

**Earl Witt**, Chambersburg, Pa.

### Free Flight Events

**Pete Sotich**, Chicago, Ill., Category Manager/Director; **Charles Danila**, Philadelphia, Pa., and **Bob Robinson**, Philadelphia, Pa., Power co-directors; **Jack Florenzie**, Parlin, N. J., and **Bernie Shulman**, Falls Church, Va., Non-Power co-directors; **Floyd Miller**, Columbus, Ohio, Helicopter; **Bud Tenny**, Richardson, Tex., Indoor; **Jim Perdue**, Athens, Ala., Indoor; **Ralph Kuenz**, Detroit, Mich., Indoor Scale.

### Control Line Events

**Pete Peters**, Dallas, Tex., Category Manager; **Gosta Johnson**, Rosemont, Ill., Category Director; **John Smith**, Ft. Wayne, Ind., Speed; **Luther Roy**, Fairfield, Calif., Speed; **Murry Frank**, Wichita Falls, Tex., Combat; **Ray Galloway**, Cleveland, Ohio, Combat; **Art Johnson**, Rockford, Ill., Carrier, Processing; **Dick Marek**, Carpentersville, Ill., Carrier; **Don Jehlik**, Falls Church, Va., Stunt, Team Racing; **Whalon Webb**, Harvey, Ill., Rat Race, Goodyear; [redacted] **Tuma**, Downers Grove, Ill., Rat Race, Goodyear; **Cal Shumate**, Blue Island, Ill., Rat Race; **Merle Booker**, Chicago, Ill., Rat Race; [redacted] **Pirkle**, Champaign, Ill., Team Race.

### Scale Events

**Clark Macomber**, Winnetka, Ill., Director; [redacted] **Ogden**, Normal, Ill., CL Leader; **Dave Shipton**, Delavan, Ill., FF Leader; **John Casburn**, Ft. Worth, Tex., RC Leader.

**Scale Assistants: Chuck O'Donnell**, Sparta, N.J.; **Bill Knepp**, Middleburg, Pa.; **Russ Barrera**, San Marcos, Calif.; **Dennis Soderstrom**, Broadview, Ill.; **Fernando Ramos**, Villa Park, Calif.; **Ron Connor**, Park Ridge, Ill.

*(continued on page 62)*

# Indoor Program to Pick 1972 U.S. Team

**Program Entrants.** The 1971 Indoor Team Selection Program to pick the three-man U.S. World Championship team is open to all Indoor flyers who have a 1971 AMA license and an FAI stamp. Flyers chosen for the team must be at least 14 years old by the time of the 1972 Indoor World Championship.

**Program Structure.** There ■■ three levels of qualification: Local Qualification Trials, open to all program entrants; Semi-Final Trials, open to Local Qualifiers and to certain others (see Qualification Requirements below); and Team Selection Finals, open only to Semi-Final Qualifiers.

**Program Entry.** The program may be entered two ways. First, ■ flyer may send the proper fees to AMA HQ; he will be issued a Program Entry Form which entitles him to unlimited attempts to qualify for the Semi-Final Trials, up to the Local Qualification deadline. Second, he may enter the program by paying the same fees to the Contest Director of a Local Qualification Trial. All who qualify at any Trials will be issued ■ Notice of Qualification, while those who enter at a Local Trials and fail to qualify will receive ■ program entry form entitling them to continue to try to qualify.

**CD Entry.** Contest Directors of Local Qualification Trials and Semi-Finals Trials may fly in those events provided that two contestants or other officials time the CD's flights. The CD of the Team Selection Finals may not compete in that meet.

### Qualification Requirements

**Local Qualification Trials.** Entry fee —$2 for Juniors, $5 for all others. Seventy-five percent (75%) of the entrants in each Local Trials will qualify for the Semi-Final Trials; also, any flyer whose score is 75% of the winning time for that Trials will qualify for the Semi-Finals. Program entrants who enter via AMA HQ may also qualify by entering a regular AMA sanctioned Indoor contest; in this case, qualification is achieved by scoring 75% of the winning time in a regular contest event. The flyer must use a model which qualifies for FAI Indoor, and qualification score is computed from the contestant's regular contest flights. **Special Note:** Program entrants who would have to travel 200 miles or more to enter either a Local Trials or an AMA Indoor meet may bypass the Local Trials level and enter the Semi-Final Trials by paying the entry fee. However, this action must be cleared through the Program Administrator, and the flyer must have made entry via AMA HQ before the Local Trials deadline.

**Semi-Final Trials.** Entry fee—$2 for Juniors, $8 for all others. Two-thirds of the Semi-Final entrants, plus all flyers who have 80% of the winning time for that Trials, will qualify for the Team Selection Finals.

**Team Selection Finals.** The top three entrants in the Team Finals will represent the U.S. at the 1972 Indoor World Championships. Entry fee—$10 for all entrants.

### Qualification Trials Schedules

**Local Qualification Trials.** An unlimited number of Local Trials may be held in the U.S. between January 1 and May 15, 1971. Each Trials must be sanctioned through normal channels as for AMA contests and have ■ minimum of four entrants as defined above. Each program entrant may enter any or all the Local Trials he wishes, until he qualifies. Each Local Trials may be flown under any ceiling height, but must use full FAI rules except that rounds need not be flown. In the case of AMA contests used for qualification, AMA rules shall apply, and the qualification scores must be computed from the regular contest results. **Note:** Program entry for purposes of qualifying via AMA contests must be accomplished before the contest; the entry fee must be postmarked to AMA HQ not later than midnight of the day before the contest. Program entry does not constitute entry into the contest.

**Semi-Final Trials.** At least four Semi-Finals will be held: one on the West Coast, one on the East Coast, and two in the Central U.S. In addition, any area at least 450 miles from a scheduled Semi-Finals may apply for a Semi-Final meet through the Program Administrator, provided this area has a minimum of five qualifiers who will enter such a Semi-Finals. Semi-Finals must be completed by July 15, 1971, and may be flown under any ceiling height. Full FAI rules will be used, including the use of rounds. Each qualifier may enter only one Semi-Finals, but he can enter any Semi-Final in the country.

**Team Selection Finals.** All reasonable effort will be made to schedule the Finals reasonably close in time to the Nationals, but the program's need for an adequate site and sufficient flying time may override other considerations. A two-day Finals is planned in order to adequately accommodate the anticipated increase in Finals entry. FAI rules will be strictly observed, and contest management will be patterned after World Championship practice so far as possible.

**For More Information.** Program Administrator is Bud Tenny, Box 545, Richardson, Tex. 75080.

# Senator Monroney New NAA President

A. S. Mike Monroney

**A. S. "Mike" Monroney,** long-time Chairman of the Senate Aviation Sub-Committee and author of the Federal Aviation Act, was unanimously elected president of the **National Aeronautic Association** for the ensuing year at the 1970 Annual General NAA Meeting in Washington, D.C.

Recipient of the coveted **Wright Brothers Memorial Trophy** for outstanding service to aviation and the first **Collier Award for Distinguished Congressional Service,** Senator Monorney during his 30-year tenure on the congressional scene has been a dynamic and articulate spokesman for United States aviation progress.

The election of Senator Monroney promises much for NAA and its family of organizations. As a former senator, Monroney is on a first name basis with top government and business leaders. He is able to represent sporting aviation interests at the highest levels in such agencies as the Federal Aviation Administration and the Federal Communications Commission. In addition to his prestige, however, the greatest contribution of his office is expected to be his active personal participation in spearheading efforts to gain support and appreciation for NAA family projects and interests. From the AMA viewpoint these may include protection of radio control frequency usage, freedom from federal regualtion of model flying, aid to our national and world championship efforts.

As President of NAA, America's oldest and most prestigious aviation organization and the U.S. representative of the **Federation Aeronautique Internationale,** world authority for the certification of aeronautical record achievements, Senator Monroney will represent on the national and international scene the interests of more than 100,000 sport aviation enthusiasts who make up the membership of NAA's divisions and affiliated organizations. Within NAA's corporate membership are many of the nation's key aviation industries representing the entire spectrum of commercial and business aviation.

Presently an aviation consultant in Washington, D.C., Senator Monroney succeeds **Frederick ■ Lee,** a vice president of Olin Corporation, who was elected to Chairman of the Board of NAA.

Other newly elected key officers of the association include: Senior Vice President, **Robert J. Murphy, Jr.,** vice president of the Boeing Company; Executive Vice President, **J. B. Montgomery,** President of CCI Corporation; Treasurer, **Joseph S. Murphy,** Editor and Publisher of "Air Transport World"; Secretary, Miss **Ann Wood,** public relations director of Pan American Airlines; and General Counsel, **Joel H. Fisher,** Washington, D.C., attorney.

Serving with the above elected officers on NAA's Executive Committee are several appointees: **Dr. Mervin K. Strickler,** President of the National Aerospace Education Council and the Federal Aviation Administration's Special Assistant for Aviation Education, representing NAA's affiliate organizations; **Arven H. Saunders,** President of the Aero Club of Washington and FAA's Director of National Capitol Airports, representing NAA's regional chapters; and **John Worth,** Executive Director of the Academy of Model Aeronautics, representing NAA's divisions. The NAA divisions include the AMA, the Soaring Society of America, the U.S. Parachute Association, the Aerobatic Club of America, the Balloon Federation of America, and the National Pilots Association.

# AMA News Extra . . . . .

DECEMBER CIAM MEETING

For the AMA and U.S. modelers one of the most important outcomes of the December 3-4 meeting of the Federation Aeronautique Internationale (FAI) Committee for International Aero Modeling (CIAM) was the approval of the 1971 RC Aerobatic World Championships in the U.S. at the Bucks County Airport near Doylestown, Pa., September 15-19. This will be the first modeling World Championships for the U.S. since 1954, when the AMA hosted the FF events. Fourteen European delegates--from among 24 nations from all over the world in attendance--indicated their nations would send teams. With the expected increased participation from Western Hemisphere nations, this could be the biggest RC World Championships ever.

An important aspect of AMA's proposal to be host was the plan to transport competitors and supporters from Europe at reduced fares on a chartered jet. This is a bold venture, with the entire financing to be generated within AMA. It is a main reason why AMA's organizing committee selected the Bucks County Airport over larger government facilities; the airport is privately owned, free of restrictions on selling tickets for admission and parking. AMA will be heavily dependent on income from this source, plus contributions from members, clubs and manufacturers, to break even. The World Championship, with its companion International RC Exposition, Pylon Races, Gliding competition, will be something worth traveling many miles to see.

New FAI Rules

A surprising announcement was made at the beginning of the meeting by Sandy Pimenoff of Finland, president of the CIAM: at the FAI General Conference (for all sport aviation activities) the week previous at New Delhi, India, a ruling had been made that, "for a period of the next four years, there will be no changes made in FAI Sporting Codes concerning matters of (a) model specifications, (b) World Championships or (c) record attempts." This announcement immediately increased the importance of the numerous proposals to be acted upon from the 36-page CIAM agenda, as this was the last opportunity to make changes before the "freeze".

Free Flight. The flyoff procedure for FAI Power contests was changed (from increasing the duration one minute each round) to a reduction in engine run by two seconds each round, the max time remaining three minutes throughout, until the 10th round, after which the engine run will continue at four seconds. Another flyoff procedure change for FAI Power only is that it will be done in a sequence chosen by lot for each round, and each competitor in turn must launch within two minutes of when the previous engine run has stopped.

Indoor. A much discussed minimum weight proposal was vigorously opposed by the U.S., and several nations originally supporting this idea reversed their positions, but when the final vote was taken there were enough votes to pass a new rule requiring that Indoor World Championship models must weigh a minimum of one gram without rubber. Otherwise, the Indoor rules remain as in 1970.

Control Line. A rule was passed requiring the person starting the engine to be a team member or the team manager. New definitions and new official drawings were approved for many of the maneuvers in CL Stunt, essentially the same as the old but with detailed changes to have descriptions agree with current practice. For FAI Team Racing a new writing of the rules was approved; likewise, no significant change, but an improved statement of previously accepted rules.

Radio Control. No changes to FAI RC Aerobatics rules. FAI Pylon Racing rules were changed from Provisional to Official status; minor changes were made in the wording of the rules, but no significant changes were made to model specifications or manner of picking winners. A United Kingdom proposal was passed, however, which permits simultaneous starts or the staggered start system--Contest Director's preference. FAI RC Soaring rules remain in Provisional status; the rules were modified in three significant areas: (a) the launch line maximum length was increased to 300 meters; (b) the maximum flight score will be 600 points for a 10-minute max (up from 360-pt. 6-min. max); and (c) one point will be deducted from the flight score for each second flown over 10 minutes. Also, a new rule was added to require the model to land within 100 meters of the landing circle or else the flight will be annulled.

Only the major changes to the FAI rules for 1971 are reported here. Detail changes will be included in the 1971 AMA rule book.

1971 AMA CONTROL LINE RULES

The Contest Board enacted a requirement for a Safety Thong to be worn by the pilot (connecting his wrist to the control handle) in all CL events except those involving multiple simultaneous flying. The board also issued a safety interpretation for Speed models concerning how the parts are held together (pan or half-pan to upper fuselage); acceptable examples show two front and one rear hold-down bolts for a full pan, two center hold-down bolts for a half-plan plus keys (or bolts) at the front and rear. Navy Carrier releases for takeoff must now be no more than 42" from the last

arresting line of the "deck", and the requirements of a model to be eligible for Bonus Points have been extended in two respects: the prototypes must have performed carrier-type takeoff and arrested landing on either an actual or simulated carrier deck; and the wing dihedral must be visually within two or three degrees of the prototype's dihedral.

Minimum wire sizes/pull-tests. Much discussion and controversy surrounded the proposals circulated in 1970 for general readjustment of minimum wire sizes and pull-tests for all CL events. Eventually defeated were the new wire sizes proposed for the Speed classes, Navy Carrier classes and Rat Racing (meaning that the 1970 line specifications for these classes carry forward to 1971--except that the one-year extension for use of stranded lines in Carrier I and II and Rat Racing has lapsed; lines for these events must henceforth be of single strand solid wire. A chart follows showing the new minimum wire sizes and pull-tests applicable for 1971.

| | Solid | | | Stranded | | G's |
|---|---|---|---|---|---|---|
| Category/Event | 1-line | 2-line | 3-line | 2-line | 3-line | Pull |
| Combat | * | .014" | [redacted] | .018" | [redacted] | 20 |
| Stunt I (up to nominal .40) | .014" | .012" | * | .015" | * | 10 |
| Stunt II (over nominal .40) | .016" | .014" | * | .018" | * | 10 |
| Scale Racing (Goodyear) | * | .012" | * | .015" | * | 16 |
| Endurance | .016" | .014" | * | .018" | * | 10 |
| Dive Bombing [redacted] (up to nominal .40) | .018" | .016" | * | .015" | * | 10 |
| Dive Bombing II (over nominal .40) | .020" | .018" | * | .018" | [redacted] | 10 |
| Sport Speed | * | .012" | [redacted] | .018" | * | 20 |
| 1/2A (not speed) | .010" | .008" | * | .012" | * | 10[1] |
| Scale I (0-8 pounds) | .020" | .016" | .014" | .021" | .018" | 8[2] |
| Scale II (8-15 pounds) | .024" | .020" | .016" | .027" | .021" | 6[3] |
| Scale III (15-20 pounds) | .031" | .024" | .020" | * | .027" | 5 |

*Not permitted; [1]Maximum 55 lbs.; [2]Min. 55 lbs., Max. 80 lbs; [3]Minimum 80 lbs.

Other CL Rule Revisions. In Dive Bombing & Strafing an entrant will be allowed three attempts to complete two official flights. For Scale Racing (Goodyear) the pilot must hold the control handle at his chest centerline except for passing, when the handle may be raised vertically to his head for no more than two consecutive laps. For Combat the pit crew is henceforth limited to two people, and the pilot must be at the circle center for the start and remain there until the end of the match. For Stunt, two level laps between maneuvers are [redacted] required.

## 1971 AMA SCALE RULES

A new rule has been added to the Unified section which requires a listing in the scale presentation of all parts not made by the builder; and that the spinner used in flying must be the [redacted] size, shape and color as the one presented for scale judging. Also, the Scale Contest Board has agreed to study proposals for a Scale Glider class (with a 1972 target date for inception); and Peanut Scale has been established as a new AMA category.

In RC Scale the prohibition of commercially available prefabricated fuselages has been withdrawn, a Scale Operation option (contestant's choice) has been added having [redacted] 5-point maximum, and the previous provisions for a Qualification Flight have been deleted--instead, the Contest Board suggests that Scale Judging take place before official flights but that the Contest Director may hold part or all of the official flying first (with any damage caused by flight not to be counted against the contestant in static judging). For FF Gas Scale the Flight Performance Point multiplier has been changed from 4.5 to 5.0; and carbon dioxide motors are now allowed to compete in the gas-powered category.

## CLEMENS ELECTED AMA PRESIDENT FOR 1971-72

More ballots than ever before were cast by [redacted] members in the election just concluded (for AMA President and Vice-Presidents of even-numbered districts), although the percentage voting was barely ahead of the previous presidential election--due to an increase of about 5,000 AMA members this year. Of over 6,400 members voting, 3,417 ballots were cast for John Clemens, Dallas, Tex., to be elected AMA President for the 1971-72 term. Runner-up John Pond received 2,398 votes, and write-in candidates Cliff Piper and Dave Bales received 592 and 24 votes, respectively, while there were 21 miscellaneous votes for others.

District V.P. voting was recorded as follows, the underscores denoting those elected for the 1971-72 term. District II--Bill Boss (531), J. Titus* (45), Miscellaneous** (28); Dist. IV--John Patton (293), C. Telford (251), Misc.** (16); Dist. VI--Al Signorino (434), G. Lee (392), Misc.** (6); Dist. VIII--Murry Frank (545), W. Knost (220), Misc.** (3); Dist. X--Chuck Broadhurst (863), A. Chisolm* (236), Misc.** (31).

*Write-In; **Assorted Write-Ins.

**By special arrangement with the publisher this page is produced at the very last minute, just before the magazine is printed, to bring you the latest news concerning current Academy of Model Aeronautics events of national significance.**

## Nats Officials

*(continued from page 58)*

### Radio Control Events

**Ed Shipe**, Santa Barbara, Calif., Category Manager; **Kemp Bunting**, Munster, Ind., Category Director; **Bob Scott**, Annandale, Va., Pattern Director; **Glen Spickler**, Bakersfield, Calif., Pylon Director; **Don Lindley**, Crown Point, Ind., Scale Director, Pattern Assistant.

**Pattern Assistants: Robert D. Brown**, Richardson, Tex.; **Bob Kendall**, Hobart, Ind.; **Tom Scott**, Cincinnati, Ohio; **Weldon Smith**, Barrington, Ill.; **Mark Smith**, Barrington, Ill.; **Walt Forbes**, Whiting, Ind.; **Dick Straw**, Richardson, Tex.; **Dave Bales**, Indianapolis, Ind.; **Cliff Telford**, Bethesda, Md.

**Pattern Judges: Rudy Black**, Newark, Del.; **Arnie Lipschutz**, Wilmington, Del.; **Dick Austin**, Huntsville, Ala.; **Bob Upton**, Reseda, Calif.; **Jack Stafford**, Culver City, Calif.; **Bill Stuckwisch**, Florida; **Dave Lane**, Hawthorne, Calif.; **Gary Korpi**, San Jose, Calif.; **Dick Patton**, Birmingham, Ala.; **Harold Cox**, Fresno, Calif.; **Bob Siegelkoff**, California; **Paul Byrum**, Hamilton, Va.; **Jack Josaitis**, Dearborn, Mich.; **Steve Mozurkewich**, Detroit, Mich.; **Sam Crawford**, San Rafael, Calif.; **Travis McGinnis**, University City, Mo.; **Bror Faber**, Westminster, Calif.; **Bill Welker**, Cincinnati, Ohio; **Art Schroeder**, Glen Ridge, N. J.; **Bill Bertrand**, Allen Park, Mich.; **Jimmy Grier**, Chicago, Ill.; **Don Lowe**, Dayton, Ohio; **Harold Brink**, E. North Port N.Y.; **Bob Violett**, Clarksburg, Md.

**RC Tabulators: Jim Bachelor**, Philadelphia, Pa.; **Pat Kendall**, Hobart, Ind.; **Lee Ann Smith**, Barrington, Ill.

**Pylon Assistants: Jack Fabbri**, Northridge, Calif.; **Jerry Kleinknight**, Oildale, Calif.; **Sam Aragon**, Montebello, Calif.; **Don Verrell**, Bakersfield, Calif.; **Joe Stream**, Long Beach, Calif.

### Junior Program

**Ed Abram**, Ouaguaga, N. Y., Chief; **Ralph Pennetti**, Swickley's, Pa., C.D.; **Bob Underwood, Jr.**, St. Louis, Mo.; **Bob Underwood, Sr.**, St. Louis, Mo.; **Ken Wilson**, Shawnee Mission, Kans.; [redacted] **Drummond**, Kansas City, Mo.; **Bill Risko**, Willow Grove, Pa.

**Delta Dart Volunteers: Travis McGinnis**, St. Louis, Mo.; **Ed Gross**, St. Louis, Mo.; **Claire Wolff**, New York; **Denice Wolff**, New York; **Lorraine Maiorella**, Glenview, Ill.; **Darlene Stiles**, Japan; **Pat; Rich Frost**, Arlington Hts., Ill.; **Dial Harrel**, Toledo, Ohio; [redacted] **Gross Jr.**, St. Louis, Mo.; **Mrs. Sid Axelrod**, Chicago, Ill.; **Dave Platt**, Chicago, Ill.; **Tony Stuckwisch**, Kansas City, Mo.; **Jeff Taylor**, Kansas City, Mo.; **J. L. Hoover**, Flint, Mich; **Bruce Perkins**, Prairie Village, Kans.; **John Hatch**, New York; **Frank and Mike Kleinburg**, San Antonio, Tex.; **Mrs. Dave Platt**, Chicago, Ill.; **Stan Snyder**, St. Charles, Mo.; **Stan Snyder, Jr.**, St. Charles, Mo. **John Adams**, Janesville, Wisc.; **Verna St. Clair**, Peru, Ind.; **Randy St. Clair**, Peru, Ind.; **Tom Betczynski**, St. Louis, Mo.; **Bob Ogden** Normal, Ill.; **George Zeljeznjak**, Morton Grove, Ill.; **Andy Gonzales**, Granite City, Ill.; **Jack Mergele**, Crystal Lake, Ill.; **Gary Schroeder**, Morton Grove, Ill.; **Bob McCarthy**, Chicago, Ill.; **Vic Hotz**, Lombard, Ill., **F. H. Hungerford**, Titusville, Fla.; **Dick Penrod**, Willow Grove, Pa.; **Tom Hoffman**, St. Louis, Mo.; **Gene Bulinski**, Elmwood Park, Ill.; **Hugh Goulding**, Addison, Ill.; **Leon Tefft**, Chicago, Ill.; **David Buck**, Woodstock, Ill.; **John Vames**, Glenview, Ill.; **John Thornhill**, Mt. Airy, Md.

### Tabulation

**Cliff Piper**, Atkinson, N. H., Chief; **Bruce Sparrow**, Agawam, Mass.; **John Papageorge**, Hadley, Mass.; **Robert Barkowski**, E. Hampton, Mass.; **Ronald Anusiewicz**, Northampton, Mass.; **Frank Nantais**, Indiana City, Ind.; **Bud Tenny**, Richardson, Tex.

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### Trophies

**Patty Thornhill**, Mt. Airy, Md.; **Max Ripken**, Baltimore, Md.

### Hobby Shop

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**John Worth**, Executive Director; **Frank Ehling**, Technical Director; **Carl Wheeley**, Publications Director; **Earl Denny**, Office Manager; **Danny Harrah; Roy Relph; Barry Silverman; Art Lalonde.**

**HQ Assistants: Betty Stream**, Long Beach, Calif.; **Judy Rankin**, Ellicott City, Md.



## CONTEST CALENDAR

### Official Sanctioned Contest of the Academy of Model Aeronautics

**Feb. 7—Green Bay, Wisc.** Winter Polar Bear FF Meet. Site: Frozen Green Bay. R. Cowles CD, 2424 Ducharme Ln., Green Bay, Wisc. 54301. Sponsor: **Green Bay R.U.F. Club.**

**Feb. 21—Aurora, Colo.** (A) MMM Monthly Indoor Meet. Site: Hinkley High School. D. McGhee CD, 1200 Elm, Denver, Colo. 80220. Sponsor: **Magnificent Mountain Men.**

**March 21—Aurora, Colo.** (A) MMM Monthly Indoor Meet. Site: Hinkley High School. G. Batiuk, Jr. CD, 3000 So Upham St., Denver, Colo. 80227.

**April 18—Phoenix, Ariz.** (A) Spring FF Contest. Site: Pinnacle Peak. W. Morris CD, 7422 E. McKinley St., Scottsdale, Ariz. 85257.

**May 2—Hadley, Mass.** (AA) Hampshire Showdown RC Air Races. Site: H.C.R.C. Flying Field. F. Mitchell CD, 290 Notre Dame St., Westfield, Mass. 01085. Sponsor: **Hampshire County RC'ers.**

**May 15-16—Jacksonville, Fla.** (AAA) FF, CL & RC Rebel Rally for 1971. Site: Imeson Airport. F. Carnes CD, 1858 Loyola Dr., Jacksonville, Fla. 32218.

**May 29—Union, N.J.** (AA) 17th Union CL Model Airplane Invitational. Site: Morrison Field. F. DeCicco CD, 53 Broadview Ave., Maplewood, N.J. 07040.

**June 5-6—Dahlgren, Va.** (AA) National Capitol RC Tournament. Site: Naval Weapons Lab. R. Violett CD, 64 B, Rt. 1, Clarksburg, Md. 20751.

**June 5-6—Lincoln, Neb.** (AA) Lincoln Sky Knights 12th Annual Midwestern Open RC Meet. Site: Arrow Airport. R. Brimhall CD, 630 Broadview Dr., Lincoln, Neb. 68505.

**June 5-6—Nashville, Tenn.** (AAA) Mid-South 8th Annual RC Championships. Site: Percy Warner Park. B. Reuther CD, 216 Vaughns Gap Rd., Nashville, Tenn. 37205.

**June 6—Hadley, Mass.** (AA) Hampshire Showdown RC Air Races: Site: H.C.R.C. Flying Field. R. Barkowski CD, 32 Lyman St., East Hampton, Mass. 01027. Sponsor: **Hampshire County RC'ers.**

**June 13—Lakewood, N.J.** Novice Only RC Meet. Site: Lakehurst N.A.S. A. Schroeder CD, 18 Spencer Rd., Glen Ridge, N.J. 07028.

**June 13—Hadley, Mass.** (AA) Hampshire County RC Thermal-Aires Meet. Site: H.C.R.C. Flying Field. J. Papageorge CD, 104 Rocky Hill Rd., Hadley, Mass. 01035. Sponsor: **Hampshire County RC'ers.**

**June 26-27—Portville, N.Y.** Southern Tier RC Fun Fly. Site: Route 305 So. B. Brown CD, 1255 High St., Bradford, Pa. 16707.

**July 17-18—Menomonee Falls, Wisc.** (AA) 1st Annual Pre-Nats RC Warmup. Site: Aero Park Airport. F. Morrissey CD, 14100 W. Park Ave., New Berlin, Wisc. 53151.

**July 18—Davenport, Iowa.** (AA) 14th Annual CL Model Airplane Meet. Site: Davenport Airport. D. Mairet CD, 3009 Westmar, Bettendorf, Iowa 52722.

**Aug. 7-8—Sayre, Penn.** Fun Fly & Hobo Meet. Site: Valley RC Club Field. C. Knowles CD, 124 Ridge Rd., Horseheads, N.Y. 14845. Sponsor: **Valley Radio Control Model Club.**

**Aug. 8—Hadley, Mass.** (AA) Hampshire Showdown RC Air Races. Site: H.C.R.C. Flying Field. B. Sparrow CD, 419 Meadow St., Agawam, Mass. 01001. Sponsor: **Hampshire County RC'ers.**

**Aug. 13-14-15—Denver, Colo.** (A) 5th Annual Old Timers Championships. Site: E. Colfax Airpark. R. Combs CD, RR #1, Box 712, Morrison, Colo. 80465.

**Aug. 22—Mansfield, Ohio** (AA) Electronic Flyers RC Meet. Site: Mt. Zion Road. M. Kalish CD, 235 Cline Ave., Mansfield, Ohio 44907.

**Aug. 29—Davenport, Iowa** (AA) Fall Annual CL Model Airplane Meet. Site: Davenport Airport. J. Kroeger CD, 1218 So. Zenith, Davenport, Iowa 52802.

## Designing RC Helicopters

*(continued from page 44)*

by actual model rotor tests at model rotor rpms. The effect of these very low Reynolds numbers on drag makes model rotor performance prediction based on full-scale helicopter rotor performance most unreliable and optimistic. Theoretically, these curves should not cross. The reason they do cross is because all tests were done on different test stands at different times using rotors with different airfoils, different twist and taper and different surface finishes.

The bottom left chart is just another arithmetic calculation to find rotor horsepower from rotor power loading and rotor thrust. Logarithmic scales were used so that the lower end of each scale would be spread out a little and the upper ends would not be spread out so far.

The usual approach to sizing a helicopter is to take the desired engine and estimate its maximum brake horsepower and its rpm at peak output. Peter Chinn's excellent engine review articles in *Model Airplane News* and the two British magazines, *Aero-Modeller* and *Radio Control Models and Electronics*, [redacted] the handiest source of engine data. The surest method of getting engine performance is to calculate it with [redacted] rig as shown in Fig. 2. It uses [redacted] Vibratach, [redacted] Heathkit Thumb Tach, [redacted] stroboscope, or even a pitch pipe, to measure rpm.

Having the horsepower, start at that point on the engine bhp scale and [redacted] straight up in the upper left chart to somewhere in the shaded band of practical values. For a first cut, 15 lb./hp is a safe bet. It is just [redacted] question of how light a helicopter can be built for the size of engine chosen, using a practical size rotor given in the upper right corner.

A smaller diameter rotor and a smaller overall helicopter for [redacted] given size engine would result in lower power loading, as most of the German model helicopter builders have done (Ref. 5). But then the disk loading will be so high that the model descends too fast in autorotation. Similarly, a lighter disk loading than shown in the shaded area of the upper right corner graph might be chosen in hopes of improving hovering performance. But it won't do any good if the model could not be built that light.

For the chosen example, [redacted] dotted line is drawn on the chart (Fig. 1). Starting with engine, the Medallion 15 RC puts out about .25 hp at 14,000 rpm. Going up along the .25 hp line to the diagonal 15 lb./hp line gives 3.6 lb. gross weight. Continue to the right, along the 3.6-lb. line to the diagonal 4-ft. rotor diameter line in the upper right corner, then straight down to the disk-loading scale, which gives .29 lb./sq. ft. Going [redacted] down to the 4-ft. rotor curve, then left to rotor power loading gives 34 lb./hp. Keep on to the left to a point between 3- and 4-lb. thrust (3.6) and go up to rotor horsepower, reading .11. Then up diagonally parallel to the line connecting rotor hp with engine bhp, and read .18 bhp. (This last step is equivalent to dividing rotor horsepower by 0.6 to get engine power, which allows a generous 40% loss of power in transmission, cooling and tail rotor.) This .16 hp is well below the .25 bhp of the Medallion 15 RC.

An O.S. Max [redacted] 15 RC, giving .29 bhp, would have been a better choice, but the Medallion was on hand, is American-made, and is easy to clamp around the front end of the crankcase. Should power be needed for [redacted] future altitude record attempt, a Cox Special 15 MK II can be dropped in with the Medallion or other type throttle clamped around the cylinder. That would put out up to .5 hp. So would a Supertigre 15 with a throttling carburetor added.

Suppose a 4-ft. rotor, 15-powered helicopter can't be built [redacted] light as 3.6 lb. or suppose some streamlining, beautifying foam plastic is to be added to the model. How heavy [redacted] it be and still take off? Start over again at .25 engine bhp, go up to 4½ lb., right to 4-ft. diameter, down to .37 lb./sq. ft., on down to 4-ft. rotor curve, left to [redacted] lb./hp, farther left to 4-½lb. thrust, up to .14 rotor hp. Then going up diagonally to engine horsepower, the line [redacted] out to .24 hp., just about where it started. This theoretical model should still be able to struggle off the ground. Had the estimate been too high for maximum gross weight, the end result would have been too high an engine hp. With a Max III 15 RC without muffler, the model could have gone up to 6 lb. and still gotten off the ground.

For those who want to size the helicopter to a radio outfit weighing a specific number of ounces, use the rule that [redacted] good helicopter has [redacted] maximum thrust of about twice its empty weight (minus radio gear and fuel). Not all flight is at maximum thrust, but perhaps [redacted] ¾ of maximum thrust. This means that gross weight (flying weight) should be ¾ of maximum thrust [redacted] 1½ times empty weight. If the gross weight is 1½ times the empty weight, then the difference (useful load) is ½ the empty weight [redacted] 1/3 the gross weight. Thus, gross weight is three times the weight of radio plus fuel. Start from this point, gross weight, on the top half of the chart, work backward to find engine bhp and forward to find rotor hp required, making changes in rotor diameter until rotor horsepower is less than .6 of engine bhp.

This chart [redacted] a well-proportioned rotor and a fairly efficient transmission and cooling system. The rotor should have a solidity (ratio of blade area to rotor disk area) of about .05 to .07. The blades should be carved to a nice airfoil shape such as the Clark Y, NACA 23012, NACA 8-H-12 or other flat-bottom airfoil. Symmetrical section NACA 0012 is good for controllability but it [redacted] about three or four percent less efficient than the ones with cambered [redacted] line. Those with undercamber would be even more efficient than the flat-bottomed ones but their high moment coefficient (tendency for the section to pitch down) would probably cause the blades to flutter or diverge at flight rpm. Taper and twist of the blades five or six degrees of washout at the tip) will also improve performance by about five percent but are [redacted] little [redacted] difficult to carve into the blades. The better the surface finish of the blade, the better the performance.

Rotor rpm should be about [redacted] noted on the diagonal lines for different rotor diameters in the upper right chart, and blade angles measured from the plane

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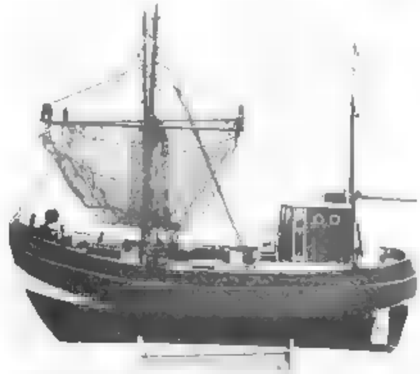

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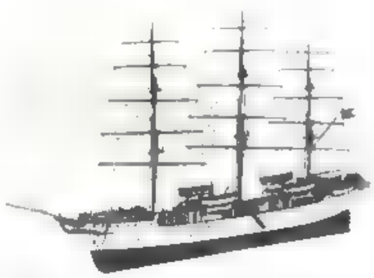

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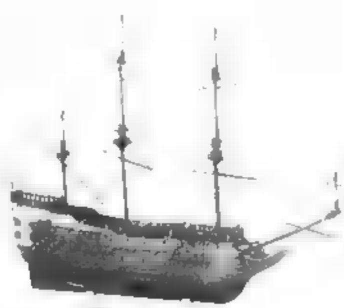

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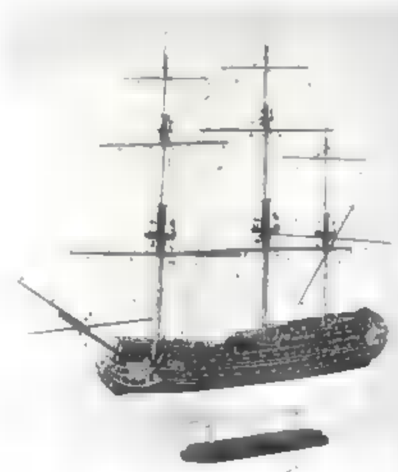

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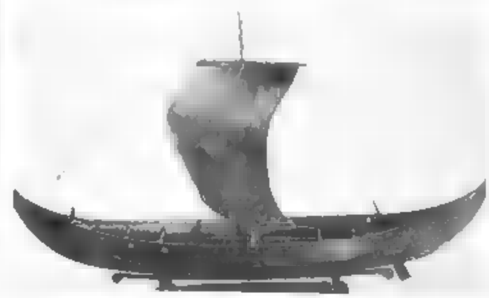

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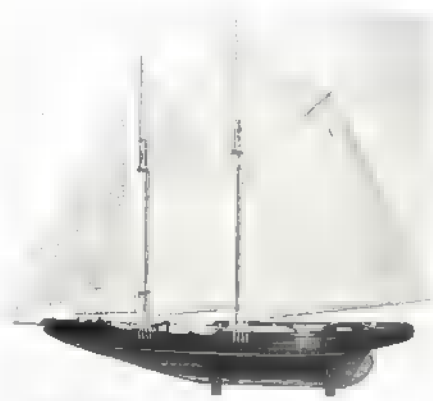

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of the rotor to the flat bottom of the airfoil should be eight to ten degrees. Tests and calculations show that running the rotor more slowly and using higher blade angle would give more thrust per horsepower. But the coning angle would be excessive and the blades would be operating nearer stall. If the model goes forward very fast, the retreating blades will stall (those blades whose tips are going toward the rear). Stalled blades mean rough running, vibrations, and short life of the rotor system.

Some idea of possible arrangements of engine, transmission, radio gear, cooling fan, fuel tank and landing gear is needed to begin laying out the design. Some desirable attributes of a well-designed helicopter are as follows:

(1) Engine-transmission-rotor shaft should be a compact, rigid unit for accurate and enduring gear alignment and minimum structural weight.

(2) Disposable weight, especially if it is a large percentage of empty weight, such [redacted] oversize fuel tanks, should be located near the rotor shaft and CG for minimum change in CG.

(3) Radio gear should be well protected from exhaust fumes. A hovering helicopter tends to recirculate the air, especially in a confined place (closed garage).

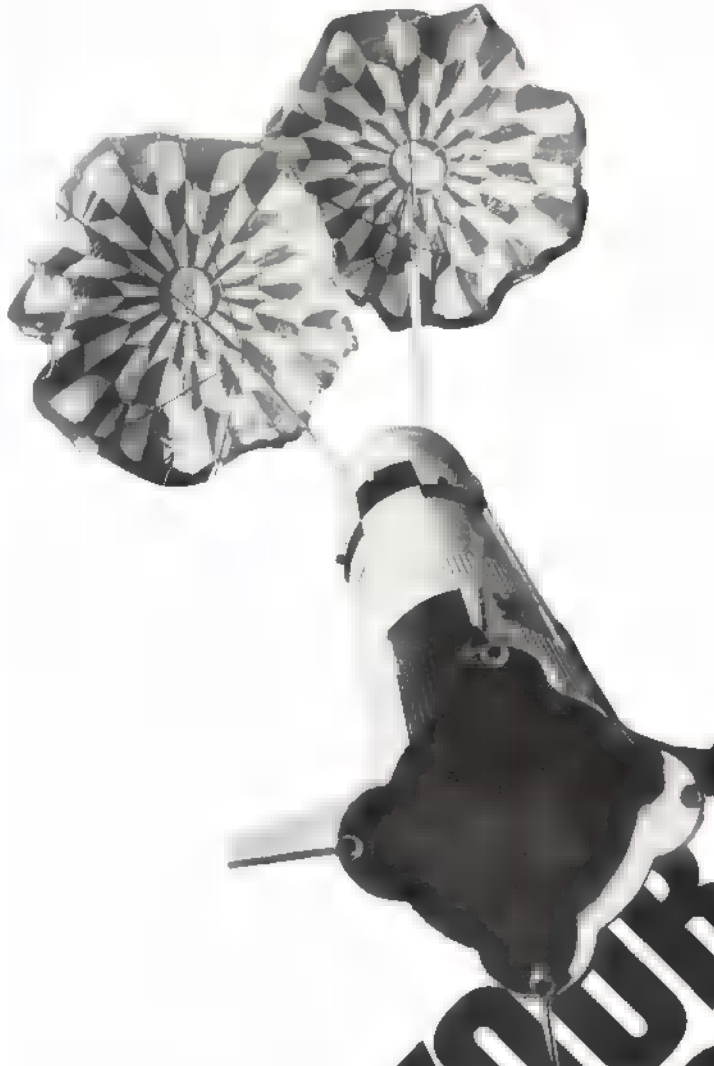
(4) Tail rotor diameter should be one-fourth to one-fifth of main rotor diameter and tail rotor rpm should be, respectively, four to five times main rotor rpm.

Several possible arrangements follow: (1) The engine could be pointed down, with a one- or two-stage spur gear reduction to the bottom end of the rotor shaft. That usually puts the needle valve below the fuel tank, and fuel drips out after filling the tank, but before starting the engine, unless the model is held in a tank-low position. A two-stage gear reduction would make the rotor turn clockwise viewed from above (left-handed). The only disadvantage of a left-hand rotor is that, when testing it in an electric drill, the drill has to be reversed or the rotor turned upside down.

(2) The engine can be pointed up, then a two-stage gear reduction would give a right-hand rotor, a needle valve above the fuel tank, and the prop shaft on top for convenient starting by electric starter. This means a clutch is needed between the motor and rotor [redacted] the engine can be started without starting the rotor. A fan on the prop shaft would blow cooling air down and would not be likely to blow exhaust drippings up onto the rotor blades.

(3) In another arrangement the engine points to one side. A spur gear reduction to another shaft running crosswise, then a 45-degree helical gear on that shaft driving a helical gear of larger diameter on the main rotor shaft, is a nice compact transmission. The engine, sticking out the side, can be started with or without a clutch. The cooling fan would blow crosswise, taking exhaust goop out the side. (Muffler or exhaust pipe is needed here to turn the exhaust 90 degrees.) The fan thrust should be opposed to tail rotor side thrust to reduce sidewise drift when taking off. The needle valve easily could be on [redacted] level with the middle of the fuel tank. When choosing an arrangement, make freehand sketches and see how the design develops, including the complexity of

(Continued on page 72)



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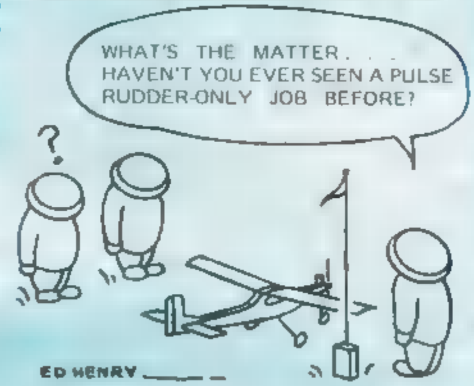
HIGGIN[redacted]VILLE, MO. 640[redacted]




Dear Friend:

Ed Henry's cartoon shown above came [redacted] a result of a speaking engagement [redacted] at the McDonnell R/C Club in St. Louis recently. [redacted] had [redacted] opportunity of showing [redacted] to show what rudder only pulse [redacted] do, and Ed, who is [redacted] old-time flyer, and whose cartoons have enlivened [redacted] McDonnell Club's "Carrier Wave", volunteered to present [redacted] drawing. [redacted] felt that it might have a message--it does; and presents it well!

The McDonnell Club [redacted] receptive and very flattering in their comments concerning our presentation, and many of them marveled [redacted] what [redacted] small PRACTICAL airplanes could do. Our movies showed how well they perform.

As one of the members commented, "There have [redacted] small airplanes before, but it [redacted] like most of these [redacted] gimmicks. What you have done [redacted] to take them out of the novelty class [redacted] flying machines out of them."

And PULSE does it.

Our foam wings [redacted] taking off! And they [redacted] proving [redacted] originality and the imagination of [redacted] customers. We've had reports [redacted] ships that have evolved by tinkerers throughout [redacted] country.

We're showing a photograph (below) of [redacted] Buckner of San Diego. Bob and his father took one of the constant chord sections and [redacted] the taper sections and [redacted] out with this 70" slope soaring glider.

He reports that it doesn't fly much faster than his Nomad, and that preliminary [redacted] most [redacted]couraging. He's mentioned several wrinkles that he wants to try [redacted] future foam wing projects, and he and his dad are most enthused about it.

From other areas come word of an .049 equipped Micro Ugly Stik; a bi-plane of the Waco. [redacted] Hoosier Hot-Shot Goodyear also is flying.

Maybe we ought to have a Mini Wing Contest? What do you think?

Yours sincerely,

Paul F. Runge

## DICK'S [redacted] PLANE KIT
### For the Beginner or Expert!

NOW! A Mini Foam Wing Airplane Kit. This is a first! DESIGNED FOR PULSE!

There are foam wing kits on the market, but with the Ace Mini Foam Wings, small planes in the 30-35" range fill [redacted] for something that [redacted] not exist in the kit field.

This kit [redacted] of the Dick's Dream, designed by Owen Kampen. Has been extensively test flown over a period of years by a number of modellers in various parts of the country. The Dick's Dream is partially a scaled down Whiz Kid--a proven performer. It has several innovations which [redacted] for the small breed of airplane specifically, and with the foam wing the beginner is assured of overcoming a big drawback to success. Features crutch type fuselage construction to assure line-up and accuracy.

Balsa and hardwood parts specially selected and clean precision cut by Lou Andrews of Aamco especially for this kit. This assures you of quality and integrity. Wire parts for landing [redacted] and torque rod, hinge material, and other extras are supplied. Wheels and engine mounting hardware [redacted] not.

Full step by step instructions to assist in building this gem of a kit. AND ultra simple installation shown for the Commander R/O Baby or Baby Twin!

Span [redacted] 32" (cut from the Ace constant chord foam section), 5½" chord, length is 25 inches. Weight with R/C gear [redacted] 12 to 14 ounces.

With a [redacted] Wee .020 and a Commander R/O Baby you have a docile performer and excellent trainer. If you want something hot, TeeDee .020 with the Commander R/O Baby Twin will do the job--it'll do everything in the Rudder Only book!

Excellent for the beginner--fun for the experienced flyer. Join in with assurance of satisfaction with the [redacted] Ace Foam Wing Dick's Dream.

No. 13L100—Dick's Dream Foam Wing Airplane Kit $5.95

## ACE MINI FOAM [redacted]

Special 17% semi-symmetrical airfoil expanded foam developed by Owen Kampen for the small planes.

The constant chord [redacted] 35" span, width is 5½". Area is 192.5. Weight about 3 oz.

The taper section [redacted] 35" span, center is 5½" which tapers to 4". Area is 166.24. Weight is just over [redacted]

Come in two 17½" pieces which may be easily epoxied for desired dihedral. May be used unfinished. Or may be finished with polyurethan varnish. Stripe with Monokote for trim.

Build small with foam. Makes planes which [redacted] ideal for the Cox Pee Wee or TD .020 engines, and the Commander R/O Baby [redacted] Baby Twin units.

No. 13L166—Ace Foam TAPER Wing $2.95
No. 13L192—Ace Foam CONSTANT Wing 2.95

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- SIMPLEST--only one moving part, easily serviced and maintained; noise free.
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Designed for the new small PRACTICAL flying machines. These designs really fly--and fly well; not in the novelty class. Easy to build, low in cost, inexpensive to fly. Fly in limited [redacted]


### COMMANDER R/O PULSE COMBOS

** New, smaller transmitter case
** 50% more powerful actuator
** COMBOS with all batteries AND charger!

If you are going the routine way, and want to get started with what we recommend for all ordinary applications, this is the way for you. Here you have the Basic R/O Pack (A) and the suggested B-C matched.

| | |
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| 10G15–COMPLETE R/O Baby Combo | $69.95 |
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| 10G16–COMPLETE R/O Standard Combo | 71.95 |
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26.995, 27.045, 27.095, 27.145, 27.195 mHz.
Please Specify

**WITH ALL BATTERIES AND CHARGER**

### DE MICRO GEM RECEIVER AVAILABLE

Our smaller Commander Micro Gem DE receiver [redacted] available for any of the foregoing [redacted] Basic Pack Combos. The Gem Superhet measures only 1 1/16 x 1 1/2 x 1/2 and weighs less than 1 oz. This a DE (double ended) version exclusively for Adams actuator [redacted] If you wish this receiver with your Basic Pack or your Combo, simply specify "With Gem"--and add $5.00 to the price.

### COMMANDER BASIC R/O PULSE PACKS

**Available in Four Sizes**

[redacted] offering our Commander Rudder Only series in both "Choose-Yourself" style, and in [redacted] combos [redacted] last year. This offers you greater choice and therefore more versatility.

Our Basic Pack (A) comes less batteries and charger. You select the size of the battery pack and charger kit (BC) you want, and this ABC makes it YOUR combo. (If for instance, you have a glider in which you want to use just the Baby or Baby Twin Pack, BUT need 500 ma nicads instead of the usual 225 ma, you can get this combo by just ordering the right choice of A [redacted] BC units.

To help the beginners, [redacted] also offer the usual combos which contain the Basic Pack (A) plus the Battery [redacted] Charger Kit (B-C) which have proven to be the best all-around combinations.

The [redacted] Packs contain the new improved Dickerson Designed Rudder Only Pulse Transmitter, the Commander DE 2.4 [redacted] superhet receiver, and four choices of size on [redacted] more powerful Adams actuator.

The Baby and Baby Twin are ideally suited for the new Ace Mini Foam Wings, and the Mini Foam Wing plane kits, while the Standard and Stomper will handle larger jobs--even up to .19-23 size and Motor Control may [redacted] added.

The Baby is for .010 to .020 jobs. Airborne weight 2.5 oz. (If you [redacted] nicads).

The Baby Twin [redacted] for hot .020 to .049 ships. Airborne weight 2.9 oz. (If you use [redacted] ma nicads).

Use the Standard for more power for hot .049 [redacted] .09 power. Airborne weight 4.5 oz. (If you [redacted] 500 ma nicads).

The Stomper [redacted] the workhorse and will be [redacted] in ships from .049 to .19-23. Weight 4.9 oz. (If you use 500 ma nicads).

**ALL UNITS ARE COMPLETELY WIRED, TESTED, GUARANTEED**

| | |
|---|---|
| 10G25–Basic R/O Baby Pk (A) | $59.95 |
| 10G25T–Basic R/O Baby Twin Pk (A) | 62.95 |
| 10G26–Basic R/O Standard Pk (A) | 59.95 |
| 10G27–Basic R/O Stomper PK (A) | 62.95 |

Specify frequency: Available on 26.995, 27.045, 27.095, 27.145 or 27.195)

### COMMANDER BTRY. [redacted] CHGR. KITS

The two kits you need [redacted] make up any of the four R/O Packs to come up with the Combo of your choice. Consist of 2.4 Nicad Battery Pack in either of two sizes (you CAN [redacted] pen cells, but we don't recommend it), Mallory M1603 Transmitter Battery, and Deluxe Charger complete with submini jack and plug. Charger is transformer isolated for your protection.

The B-C (Batteries & Charger) Kits are available in two sizes. For ordinary use we recommend the [redacted] ma size for the Baby and Baby Twin. The [redacted] unit is generally used for the Standard or Stomper units. (You can switch either way, depending on your requirements.)

Completely assembled.

| | |
|---|---|
| No. 10K35–B-C 225 Kit for Baby [redacted] Baby Twin | $10.75 |
| No. 10K36–B-C [redacted] Kit for Standard or Stomper | 12.75 |

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[redacted]
For [redacted] Flyer [redacted] Tinkerer

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Our NEW Handbook-Catalog is bigger and better than ever. We specialize in equipment for the Beginner, Sunday and Fun Flyer. More items [redacted] the do-it-yourselfer, more products from most major [redacted], in addition to many [redacted] exclusives. Greatly enlarged [redacted]. Last year this was called "bible for R/C", "a MUST!" by R/C editors. Price is just $1.00 POSTPAID. This is completely refundable on your first order! And that order also puts you on our mailing list for our newsletters and R/C Data Service—acclaimed the world [redacted]. You can't lose—send your buck [redacted] a round trip today. It could be the best dollar you ever spent!

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**No. 1291, Demon Delta** — Fast, wild-stunting C/L for 35-45. Looks like modern fighter. Attract attention for demonstrations. By Jerry Farr. **$2.50**

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No. 1101. **Autogiro** — Simple 049-powered model builds fast and gives unique performance. Pusher prop or motor. **$1.25**

No. 1102. **Aerobile** — Large scale CL or RC of a famous Waterman roadable plane. Uses 45-60 motor. Wing detachable, car drivable! Large single-sheet plans. **$4.00**

No. 1103. **Akromaster** — RC scale/stunt model of real aerobatic plane for 45-60 engine. Fast and responsive, easy to make, simple shapes. **$2.75**

No. 1104. **Tardon** Formula II semi-scale pylon racer or stunt plane for 40 engines. Won event at 1969 NATS. Groovy flier. **$3.00**

No. 1201. **Stiletto** Unique ½A proto model uses much-extended motor shaft for clean prop thrust and speed. **$1.00**

No. 1202. **King Kong** Huge flat-land soarer for competition use has 12' wing of glass, foam, and balsa. By Sarpolus. **$3.25.**

No. 1203. **10-Hi** -Six-foot span, 049-powered flying wing is high-performance model with sporting flair. Huge plan. **$3.50.**

No. 0111. **Dragonfli** -- Fast graceful competition stunter by Phil Kraft. Uses big 60's and retracts. **$4.00**

No. 0112. **Toothpick** — Long thin winged combat CL ship is both fast and quick turning. For hot 35's. **$2.25**

No. 0113. **Luton Minor** — Delightful 10-powered semi-scale RC for three light servos is high-winged parasol monoplane. **$2.25**

No. 0211. **Cobra** Steve Wooley's great, smooth-flying CL stunt ship for 35's. Light model, ideal for both FAI and AMA patterns. **$3.50**

No. 0212. **Voodoo** — Converted Goldberg kit for streamer-towing RC combat, by Ed Sweeney. Two servos with 19 engine. For new event. **$2.75**

[redacted]. 0213. **Guillotine** Modified from CL for RC combat. Maneuverable, fast, responsive, and fun. Glides well. For two servos and 19 engine. For new event. **$2.75.**

**THIS MONTH'S PLANS**

No. 0312. **EKKO** — A compact FAI pattern and sport model [redacted] engines. All wood low-winger. **$3**

No. 0311. **Skydancer** — Two-channel-equipped RC boost glider using aileron and elevator control. Lofted by new, powerful rocket motor. [redacted]

*(Continued from page 66)*
structure needed to hold it together.

(4) The arrangement chosen for further discussion is shown on the chart: Preliminary Sketches and Weight and Balance. The engine sits in front of a piece of sheet metal bent up into a square U shape. The prop shaft, pointing forward, holds a small spur gear, a centrifugal clutch, a fan/flywheel and a spinner for starting by electric motor. The spur gear drives ■ larger gear out to the left side on an intermediate shaft running back just inside the U-shaped frame past the fuel tank to the main rotor transmission. There, 45-degree helical gears perform the right-angle drive to rotor shaft and give a further speed reduction. Bulkheads in the U channel, and ■ cover plate on top, serve to enclose the rotor transmission, allowing it to be partly oil-filled for lubrication. The intermediate shaft comes out the rear of the rotor transmission and is connected to ■ piece of 1/16" music wire drive shaft to the tail rotor.

The two main rotor control servos mount on a plywood platform over the fuel tank and transmission. The throttle servo and connection to main rotor collective pitch are underneath the channel below the fuel tank. The landing gear attaches to the bottom of the channel. The tail rotor servo is mounted in the forward end of the tail boom so that when the latter ■ removed the servo can merely be unplugged. The aft end of the tail boom turns up to get the tail rotor higher off the ground for operation in grass and for flared landings. The upturned boom end is made wide enough to add fin area for better directional stability. The flexible shaft drive turns this corner without difficulty inside a nylon guide tube.

The preliminary weight and balance estimate is not difficult. Merely list various parts of the helicopter in convenient groups. Estimate the weight of each group and write it down. This is largely common sense guesswork, perhaps aided by actually weighing a few items—such as a piece of shafting or pine wood the size of a blade or a piece of music wire for landing gear. Estimating the CG of each group by eye is easy. Then measure the distance of each group CG from the datum line up front and write that down under H arm. Multiply each weight by its H arm to get moment. Add up the moments, divide by the total weight to get the aircraft CG. In this case, the first trial put the CG at 9.7, in., whereas the rotor shaft was at 8.2 in. That's bad.

Two trials later, after moving batteries forward and rotor transmission aft, the CG came to 10.2 and the rotor was at 9.7. The transmission will be moved aft a little in the full-scale layout to bring the aircraft CG slightly ahead of the rotor shaft.

Undoubtedly this will not be the final arrangement but is only a reference point. If something is moved aft, something else must go forward to preserve an approximate balance. After the model is finished, the batteries probably will have to be shifted elsewhere to achieve proper balance.

Next step in the design is ■ full-scale layout and solving design problems. The choice of rotor and stabilizing system can be left until later. Hopefully an idea for that ideal stability or control system may develop

[redacted] a result of experimentation.


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(1) Schluter, D., "Model-Hubschrauber-Technik," a series of articles, *Modell*, Jan., Feb., Mar., Apr., May, 1969.

(2) Andrews, J., "Helicopter Aerodynamics," Parts I and II, *Radio Control Modeler*, Oct., Nov., 1967.

(3) Gessow, A., and Myers, G.C., *Aerodynamics of the Helicopter*, Frederick Ungar Publishing Co., New York, N.Y.

(4) Burkam, J. E., "A Radio Controlled Helicopter," paper presented at the DC/RC Symposium, May 1969.

(5) Burkam, J. E., "First International R/C Helicopter Competition," *Model Airplane News*, April 1969.


## Plane that had it all

*(continued from [redacted] 29)*

Other Gammas—mainly 2Es—went to [redacted] number of countries for [redacted] variety of reasons. One that got as far as Sweden was SE-ADW Smaland, used by [redacted] predecessor of today's Scandinavian Airlines System in night airmail flying until aileron flutter proved its undoing. At least two found their way [redacted] Great Britain, [redacted] being [redacted] Model [redacted] used for experimental purposes by the Air Ministry, and the sole Model 2L used by Bristol [redacted] flying test bed for its Hercules sleeve-valve engine.

Rumors aside, only one complete Gamma is known to be in existence: the ski-equipped Polar Star, which is [redacted] display in the Smithsonian's Silver Hill, Md., facility. [redacted] is in excellent condition, except for some dents and scratches acquired many years [redacted] when [redacted] was slithering around the ice. But that's what history is made of.

Specifications of the basic single-seat Gamma

Dimensions

Length 29' 9"
Wingspan 48' 0"
Wing Area 363 sq. ft.
Empty Weight 3500 lbs.
Normal Loaded Weight 7000 lbs.

Performance

Maximum Speed 215 mph
Cruising Speed 191 mph
Landing Speed 63 mph
Initial Rate of Climb 1000 fpm
Service Ceiling 20,000'
Absolute Ceiling 22,500'

## You Said It!

*(continued from page 12)*

grass and weeds a full 60 feet from where I wanted to land—described as "beautiful" by my only witness, [redacted] local RCer whose own plane wasn't flyable that day—simply because it resulted in absolutely zero damage.

This is the point I'm at now, looking forward to attempt number five this Sunday. But I'm taking time to write this because I am glad I entered the realm of RC flying via the direct route. Whatever the future of my Squire, I'm hooked.

From an absolutely novice point of view, I would recommend that those considering RC flying should do it the same way. I think it is the least expensive route, because it completely skips the cost of control line planes and smaller engines. Instead, start with exactly what you want to learn—RC flying. Requirements: one engine, one radio and a stable plane. And, of course, one expert to put the first flight on it, so you don't try to learn on something that is so badly out of trim even an expert can barely handle it.

As I mentioned, thanks [redacted] due to many of the articles in AAM. Some were helpful, some were too advanced to be helpful—but they were inspirational! Even the ads came in handy by allowing me to identify a few of the mysterious parts in my "I wonder what these are" pile. Don't know what to do with the ones I couldn't identify—maybe there will be a use for them [redacted] my next plane.

**Dennis Lanahan, Valdosta, Ga.**

## Marks on [redacted]C

*(continued from page 39)*

control when I have only a football field to fly on, with bleachers all around?"

I had to chuckle [redacted] bit and thought perhaps he should quit while he is ahead if that kind of performance is achieved!

To answer the question, galloping ghost is [redacted] form of pulse. The difference to which you refer is commonly known as rudder-only pulse, versus galloping ghost. Rudder-only most often involves the use of [redacted] magnetic actuator to provide proportional rudder control. This will achieve the same control available from escapements but with the added feature of proportional control. It is much easier to fly than escapements at about the same weight. At least one unit is available with an airborne weight of less than three oz. and with control power quite sufficient for your needs.

Galloping ghost makes available two additional control functions: elevator and throttle, in addition to rudder. There are some shortcomings, primarily added weight (about eight oz. total). Some interaction between functions is unavoidable. Throttle changes [redacted] achieved at the expense of momentary loss of rudder and elevator control. GG has one quirk which could be nasty in [redacted] football field —a momentary blast of up elevator during throttle changes. This can be overcome by diving slightly before changing throttle [redacted] by [redacted] of gimmicks which reduce the elevator travel at extremes of actuator travel.

Basically, those are the differences between GG and rudder-only pulse. Much more detail can be learned by writing to the "King of Pulse," ACE R/C, Higginsville, Mo. 64037, with one dollar for the catalog/manual. Better yet, it can't be too far from Rolla to Higginsville for a first-hand look.

## McEntee on RC

*(continued from page 41)*

had batteries good for 24 hours of continuous flying. The previous record of 132.7 miles was set by a Czechoslovakian. Now [redacted] French pilot has applied to FAI for recognition of his closed course record of 200.2 miles (information gleaned from "Radio Control Models [redacted] Electronics"). Who's next? . . .

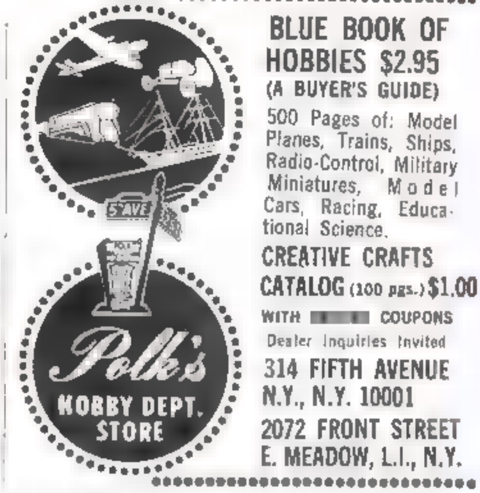
Official Glider Event at Nats?: This matter was not taken up at the RC Contest Board meeting during the 1970 Nats week, because of press of other business. RC CB Chairman Bill Northrop has contacted members of his group and is following up on the matter. Some action is likely by spring. However, it is improbable that the rules will be settled in time for inclusion in the 1971 Rules Book. They will be publicized in the model magazines and through AMA mailings.

Several groups have sent in rules proposals which must be gone [redacted] by the CB members to resolve differences. Meanwhile, glider groups [redacted] both coasts are formulating contest plans for 1971. Not much has been heard from other parts of the country, although much glider activity exists in many other than just the coastal areas. . . .

Latest from Walla Walla: Harley Michaelis reports from the Northwest on his newest, the Hi-Pro. It utilizes the wing attachment system previously shown in this section. Since the fuselage is only three in. wide, [redacted] center braces were needed and there is negligible flex in the wing support system. The craft was designed to handle and penetrate well in high winds and [redacted] stand very tight elevator turns.

The 113-in. span wing has a near symmetrical airfoil, which tapers three mm per two in. of span. The leading edge is quite sharp to increase speed, but care must be taken to avoid stalling [redacted] speed drops. It has [redacted] flying stab. Weight, ready-to-fly, is 3 lbs.,








7 oz. (Kraft gear for rudder and stab weighs 12 oz.) Local winds often [redacted] 12-15 knots. For this range, [redacted] oz. of lead is added at CG. The glider has been flown in a 35-knot wind, with still more lead ballast, and handled well (but the pilot needed goggles). The wing [redacted] is about 650 sq. in., with [redacted] 7½-in. root chord. Other wing panels can be utilized for thermal soaring or acrobatics. The fiberglass fuselage will be marketed [redacted]mercially. . . .

GraMer V8 Sailplane: Modelers looking for [redacted] light soarer of moderate size, which can be built in [redacted] hurry, might consider the V8 by GraMer Plastics (Jackson, Mich. 49201). An attractive [redacted]ft, it has a foam fuselage, wings, and V-tail, reinforced where needed by ply, hardwood strips, [redacted] a little balsa. Span is 93", area 576 sq. in., and flying weight is 28-38 [redacted]. The latter range takes in [redacted]tions in radio equipment and in finish.

All wood and foam parts for the glider (plus canopy) weigh only 13 oz.; the 45-in. long fuselage has five pieces of foam, totaling only 1½ [redacted]. Foam [redacted] all of very light grade expanded bead material, and the fuselage is hollowed out for radio. The wings come in four panels, each half consists of two panels cemented together. The two resulting panels [redacted] separable at the center and [redacted] held to the fuselage with rubber bands. Wings have considerable sweepforward, [redacted] is widely used [redacted] European training gliders. Glider [redacted] be flown [redacted] slopes, towed aloft, or powered by [redacted] 049 engine [redacted] pod over wing. Kit costs $19.95.

## Lowe on RC

(continued from page 38)

find his muffler is not "effective" based on someone's subjective judgment?

The Indian City Club (Wyandotte, Mich.) has established [redacted] testing procedure by using a meter and [redacted] arbitrarily acceptable sound level [redacted] measured at [redacted] 20-ft. distance. Their muffler committee tests muffler/engine [redacted]binations for members to determine acceptability. They have noted many things, including barometric pressure, humidity, and wind, affect the meter readings. Also, [redacted] muffler which [redacted] acceptable on a particular engine with [redacted] particular prop and fuel may be unacceptable on some other combination of engine prop and fuel. I have noticed a distinctive sound level difference in one brand of muffler when used [redacted] various engines of the same make and size.

How can this problem be solved? First, any old muffler is a start toward sound reduction. Our club has [redacted] specific sound reduction requirements and we have had no [redacted] complaints. In fact, most comments [redacted] on how much quieter things are. If [redacted] member shows up with a muffler or "device" that [redacted] too noisy, a little social pressure helps him change his ways!

For competitive events, a qualified product list might be set up to include those muffler/engines/prop/fuel combinations found acceptable by some independent agency. These

could be reduced to muffler/engine/rpm combinations. Or on-site testing under controlled conditions could be required. Or the requirement could be eliminated. Any comments? . . .

For Rough Sanding: During a recent visit to Bill Welker of World Engines, he thrust what appeared to be a piece of rough window screening into my hand, saying, "Try sanding your models with this." It turned out to be 3M's wet or dry Fabricut and it does do a great job of rough sanding. It doesn't load easily and, if it does, simply rap it and it's clean again. That is the purpose of this design, Bill says. It is available at any hardware store.

## Morse [redacted] RC

*(continued from page 41)*

branch cables. National electrical supply outlets such as Olsen's Radio stock the cable, in case it can't be cumshawed otherwise.

The only electrical connections made or broken when setting up at a [redacted] are the three leads to No. 3 and No. 4 lights in the No. 2 box, so use spade terminals on these leads. Electrical terminal blocks can be used to good advantage. However, we used pine blocks glued inside the boxes with sheet metal screws for terminals and that worked out just fine.

The light boxes are made up with ¼" fir plywood. The ply cutting sketch shows how all the box material is cut from [redacted] standard 4 [redacted] 8' sheet. After cutting to size, lay out the light holes so that the indentation on the front face of the headlight will fit snugly into the hole. Two clamps on each headlight then will retain it in the mounting hole.

Each box was assembled with brads and Elmer's Glue. The lids are installed with cabinet hinges, then given a coat of gray lacquer primer and [redacted] final weather coat of acrylic white lacquer. To each end of the boxes, screw ¾" U conduit straps. The ⅝" dowel support legs slide up through when the lights are set up.

Operating the lights effectively takes a little practice because they will not respond instantly to the signal switch, since the filaments require [redacted] instant to warm up. Flagmen should stand in front of their lights and practice the turn and cut signals a few times.

We've found that switching the light "on" [redacted] the ship crosses the pylon line and holding until the turn is half completed is sufficient. It is quite obvious when the signal has been [redacted] because of the ship's immediate roll into turn—almost as though the signal switch were tied into the aileron servo.

Cuts can be relayed to the lap counter immediately by flashing the light. We recommend that only the lap counter take care of cuts. Once he sees the cut signal, he takes one finger off the lap count and it's all even, no muss, no fuss!

Only a few things [redacted] needed to put the system in operation—a beach umbrella, aluminum lounge chairs, [redacted] refreshment cooler, FM music, and four signalmen.

## Boss on CL

*(continued from page 34)*

So there's a new, unusual, and inexpensive way to build models. As for the wringer-type washing machine, I read somewhere that [redacted] quarter of a million or more are in use in the U.S., so your neighbor might just have one. . . .

Wheel Chocks: Almost every model builder has had the aggravation of knocking [redacted] nearly-finished model off the workbench. If falling to the floor doesn't damage the plane, the sudden grab by the builder usually does. John Barmore suggests using adjustable wheel

chocks [redacted] keep the model from rolling while being worked on.

The wheel chocks [redacted] easily made from scrap balsa and a few pieces of hardwood dowel. Four balsa blocks, ½ x ½ x 2", four pieces of 3/16" hardwood dowel 4" long, and [redacted] little glue [redacted] all that's required. Drill holes in two of the balsa blocks at proper wheel width and glue dowels in place. Then drill the other two balsa blocks, but make these holes [redacted] size that will give a tight slip fit for the dowel. This set of chocks [redacted] be adjusted to accommodate wheels up to 5" in diameter.

Hardwood can be substituted for the balsa blocks. In this case, consider drilling and tapping the movable block to [redacted] a machine screw (coarse thread—possibly 10/32 as a device to permanently lock the chocks for [redacted] particular size wheel.

These chocks also would be a good idea for the scale modeler to [redacted] when his plane is [redacted] display for static judging. . . .

Club Clinic: The Key City Prop Twisters (Abilene, Tex.) report [redacted] change in meeting format. Each session includes a modeling clinic during which construction, covering, finishing, etc., are discussed. This idea may be old stuff to established clubs, but this might be just the thing for new clubs to make meetings [redacted] interesting.

If your club is lacking in members capable of discussing these techniques, guest experts from nearby clubs [redacted] doubt will be willing to do the honors. A good how-to-do-it program will certainly help the younger club members, and even the oldsters might learn a thing or two. . . .

Club Historian: An ad in [redacted] recent issue of the Lexington MAC (Lexington, Ken.) newsletter asked for a volunteer for the position of Club Historian. They want a guy with [redacted] camera, who can use it, and who will collect data about club activities. Sounds li[redacted] a great idea!

Those who already [redacted] providing this coverage for their clubs should consider sending some of their information and photos [redacted] Where The Action Is for publication. Every consideration is given to all photos, technical tips, construction articles etc., for inclusion in this column.

## Meuser [redacted] FF

*(continued from page 36)*

camps, swims, made his letter running the 880-yard, pulls [redacted] B average in school, and works part-time to finance his modeling. Understandably, he complains that "Time is my only problem." As a suggestion, Rich: combine your activities. Of course, you might look a little weird towing your Nordic while running the 880 and playing the bassoon simultaneously.

Rich's Nordic is his easy-to-build version of a type typical in the Seattle area. The front of the fuselage is sawed out of half-inch plywood. If the sawing must be done by hand, it might be easier to [redacted] several thinner pieces, then laminate them. The fiberglass tailboom is a fishing rod blank, usually available at a sporting-goods store. F.A.I. Model Supply, 1112 W. Mission Lane, Phoenix, Ariz. 85021, definitely carries them, along with other useful accessories. Conventional wing construction can be substituted. . . .

Balsa-Sheet-Covered Wings: While heavier than built-up wings, sheet-covered wings are second to none in bending strength, torsional (twisting) stiffness, and warp resistance. They [redacted] ideal for sport models, flying scale if the proto has sheet-metal covering, A/2 Nordic gliders, and FAI power models. They are increasingly popular for Wakefield rubber-powered models, but they are a bit heavy. They [redacted] much too heavy for AMA Gas classes and Unlimited Rubber. A weight-saving compromise [redacted] sheet-covering only the front 20% to 40%

of the wing. Building them is not difficult [redacted] it is properly planned.

Use [redacted] building board of soft pine, [redacted] little wider than the wing, and curved [redacted] fit the bottom surface of the wing. The easiest way to make one is to glue ribs to a flat board, using the bottom edge of the wing-rib template to cut the ribs.

A more satisfactory board is made by planing the whole board to the correct shape. Trace the shape [redacted] the ends of the board using the rib template. If a table saw or radial-arm saw is available, it can be used to rough out the board by making a series of longitudinal cuts to the curve drawn [redacted] the board's end.

Put a shingle nail in each edge of the board opposite each rib position, allowing the head to project ¼ in. Cut the bottom balsa sheet to outline, draw the rib positions on the sheet, and pin it in place. Glue the leading edge, spars, if any, ribs, and trailing edge in place, in that order.

Lightly sandpaper the whole structure, using a block of wood behind the sandpaper, [redacted] ensure that all parts [redacted] flush. Then add the top sheet of balsa, using rubber bands strung over the nails to apply pressure. Use a non-shrinking glue, such as white glue, Franklin Titebond, or one of the epoxies, in preference to regular "model airplane glue." Work fast when applying the top sheet, otherwise the glue will dry too much before the sheet is in place.

For attaching the top sheet, many prefer contact cement. Simply follow the directions [redacted] the can but, remember, once the two cement-coated surfaces are in contact they [redacted] bonded and the sheet cannot be shifted. Double thickness ribs at the dihedral joints will permit block-sanding the joints to the proper angle just as is done with the points of hand-launch-glider wings. A strip of silk glued over the joint makes [redacted] super-strong.

If extra weight [redacted] be tolerated, the wings should be tissue covered. Otherwise, apply several coats of dope with a light sanding between coats, [redacted] [redacted] any conventional hand-launch-glider finishing technique. If very soft wood is used, difficulty might [redacted] in sanding the leading edge to shape, since the hard glue is not removed as rapidly as the soft balsa. This problem can be minimized if the two-piece leading edge is used.

Harder wood can be used for the added-on piece to provide a leading edge which is not easily nicked. A trailing-edge strip [redacted] be added [redacted] the same manner. [redacted] 1/16 x 1/8" spruce strip will add greatly to the durability with little increase in weight.

## Stalick on FF

*(continued from page 36)*

ard and his dad, Ed, have been promoting mini-postal-contests, for youngsters under 12, and maxi-postal-contests, for youngsters under 15. Thus far, the Utah State Aeromodellers and the Star-Skippers have dominated these events, but not by choice.

Those with youngsters who would like to participate [redacted] the next [redacted] may write Richard (P.O. Box 176, Wall St. Station, New York, N.Y. 10005) for details. Better yet, send him a dollar for the Star-Skippers newsletter, which has all of the up-to-date details, plus many interesting news items aimed at the under-15 bunch. . . .

Handy-Dandy Fuse Lighter (Called by Jack Shafer, The MK XVIII Semi-Automatic Fuse-lighter and Cockroach Exterminator?): Even with the development of precise timing devices such as the Tatone and the Seeling, many modelers still rely upon the venerable d.t. fuse. Even though this method of dethermalizing has as advantages light weight, 99

To fly [redacted] low-wing model with [redacted] scale horizontal tail, the CG must be forward of the 30% wing chord position. Then three to six degrees of up elevator relative to the wing will be required to give a good glide, and considerable downthrust will be needed to keep the model from looping under power. If the horizontal tail size can be increased, both the downthrust and the up elevator required will be less and the model will be easier to adjust.

The vertical tail size [redacted] most low-wing designs is adequate and will not require a deviation from scale. A large vertical with a very far forward CG will tend to spiral dive and, therefore, requires more dihedral. Conversely, [redacted] small vertical will allow the model to be spirally stable with less dihedral, but never less than about six degrees.

The effects of power, in addition to the nose-up tendency, will generally be a left turning tendency. Right thrust must be used to counteract the left turning tendency. Rudder also will do it, but it will affect the glide [redacted] well and must be used carefully.

To sum up, in order of importance: (1) Dihedral must be adequate, at least six degrees, eight to ten is better. (2) Balance the model and use elevator and rudder to trim for [redacted] good glide. (3) Use thrust-line adjustments for control of powered flight characteristics.



44/100% reliability, and low cost, it also has one very definite disadvantage—it has [redacted] be lit to work.

Getting [redacted] fuse lit [redacted] the right time in these no-smoking days can be a frustrating problem, so many [redacted] turning to fuse lighting devices. VTO recently ran [redacted] feature [redacted] [redacted] electric-powered lighter. Some modelers use hunks of loose fuse—sometimes threaded through [redacted] short length of ¼" ID tubing. However, a glowing loose fuse dropped on a dry field can be disastrous, and loose fuse always seems [redacted] get oil-soaked and frayed.

Putting our Yankee ingenuity [redacted] work [redacted]sulted in a reasonable solution. It's simple, dirt-proof, and snuffer-tube-equipped. With the addition of the gear advance, the fuse can [redacted] run out of [redacted] into the can without being touched. Although my lighter doesn't use the gear, fellow-flier Al Grell has suggested this improvement be incorporated, especially if [redacted] [redacted] find an old clock somewhere. Addition of weight to the bottom of the can would help keep it upright when placed on the ground.

Mine does have [redacted] bit of added class not indicated on the drawing—I put [redacted] of AAM's "Where The Action Is" stickers on the side. All that needs to be done is to light the lighter before winding up that rubber model or hooking up the batteries. Then, sneak off with that band-aid can and you're [redacted] business.

## Mooney on FF

*(continued from page 37)*

have the [redacted] dihedral effect—none. Some full-sized low wings are designed this way and [redacted] have no dihedral at all. They won't fly as [redacted] rubber-powered free flight. Dihedral should be at least six degrees and even eight or ten won't hurt.

Tail sizes [redacted] governed by the amount of stability in pitch (horizontal tail) and in yaw (vertical tail). The larger the surface, the more stable the airplane, for [redacted] given center of gravity position. The farther forward the CG, the [redacted] stable the model will be. [redacted] bomb is really stable. The further forward the CG is, the more up elevator will be required to trim the model for satisfactory gliding flight. With lots of up elevator, a model will tend to loop under power and this will have to be corrected with lots of downthrust.



## Micro-Avionics

*(Continued from page 24)*

sec. by [redacted] free-running multivibrator. The tailing edge of the timing pulse provides the synchronization pulse, i.e., the first of five pulses, used for control. This spike also triggers the first of four half-shots, or mono-stable, multivibrators whose duration is determined by stick position. A trim-type potentiometer determines the sensitivity of pulse duration variation to stick-movement. This should never need changing unless a different type of servo is used. If it is moved, the stick potentiometer setting must be changed to center the servo.

One half-shot multi is used per channel (or function). The five encoder output pulses are squared and shaped to provide modulation of the RF output with acceptable sideband and harmonic characteristics. The RF section tested was [redacted] 27.195 MHz. The system is also available on the 72 MHz band.

The receiver, servos and battery pack [redacted] housed in bright orange plastic cases—the new mark of Micro-Avionics. Electronically, the receiver is identical to the Orbit. Dimension are 1½ x 2¼ x ⅞". A double-tuned front end is followed by [redacted] conventional 455 MHz IF strip. Detected output is used for AGC in the

IF stages. Three stages of squaring provide the clock pulses and drive a pulse stretcher which provides the appropriate synchronization or reset pause for the IC decoder. One IC is used per two channels. The receiver components are mounted on a 1/16 in. glass-epoxy printed circuit board. The decoder IC's and wiring bus are located [redacted] a smaller inverted deck at the top of one end of the receiver.

Connection for power is a miniature in-line plug also used for charging. Servos are plugged into a miniature plug block, 3/8 x 3/8 x 3/8". The power pack connects to the switch harness through a second in-line connector. All plug connections to the wires are crimped and the pins are gold-plated. The aileron servo has its own separate single connector.

The system will accept any of the Datatron Orbit Micro servos, i.e., the PS-3 rack and rotary output servo, the tiny PS-1D (1⅞ x 1 9/16 x ¾") rotary output only, or the new PS-5. The PS-5 is a rotary output only servo with very heavy gears to withstand the beating meted out by cars. All can be equipped with the IC amplifier. All servos accept a positive-going control pulse 1.5 millisec ± 0.5 millisec. for control. The power supply is a center-tapped, square pack of 500 mah nickel-cadmium cells.

The IC servo [redacted] the first full IC amplifier used in RC. Manufactured by Datatron the amplifier simply incorporates essentially the standard digital feedback servo onto an IC chip about ½" square. This chip and all wires going to it, a total of seven, are potted into [redacted] cube which [redacted] glued in place. Only one design compromise was accepted in order to provide better performance. The normal servo amplifier circuit has a one-shot multivibrat[redacted] whose pulse duration is controlled by the feedback pot at 1.5 ± 0.5 millisec. and whose amplitude is inverted to the control pulse. The widths of the control and reference pulses are compared, and the wider pulse produces a positive or negative error pulse which undergoes one stage of amplification. This error pulse is at absolute maximum 0.5 millisec., generated once each frame rate, or 30 per sec. It cannot drive the servo, therefore [redacted] second stage is used for pulse stretching. Pulse stretching is accomplished by use of a holding capacitor which must be sufficiently large to stretch the error pulse to cover the full 33 millisec. until the next control pulse arrives. The older Orbit/Micro sets operated at around 16 frames per sec. Therefore, the repetition rate was upped

to 30 frames per sec. in order to permit a holding capacitor physically adaptable to the IC chip.

Those tempted to rush an order off to Datatron for IC servos should be aware that these servos will not respond properly on [redacted] system having a lower repetition rate. However, in the Micro set tested, they gave a somewhat faster response than the standard servo (0.6 sec., end to end, vs 0.9 sec.). Power output was approximately 2½ lb.

The system was flight-tested and bench-tested thoroughly and no problems were encountered. The set functioned properly from 20 degrees to 150 degrees F.

The airplane built and tested was Sterling's Lancer, which was constructed from the kit by Duane Lundahl. The ship is covered with black Super MonoKote. Longitudinal bands on the wings are gold and all other striping is orange and yellow wet MonoKote (Was Duane inspired by the nearness to Halloween?). It is indeed a pretty bird.

The quality of materials in the kit was excellent and plans are good and easily followed. Only [redacted] construction modification had to be made. The slot cut into the aft top deck for the vertical fin leads off by about 3/32" from front to back. Check this by sighting in before final assembly, cutting out on [redacted] side to align, filling the opposite side and gluing firmly.

The wing jigging arrangement [redacted] quite good; however, [redacted] with any wing, work must be done on [redacted] truly flat surface and everything pinned down tightly. The best building board yet found is a mahogany sandwich door. They are true, never warp, and can be set away when not in use. Damaged doors are usually available for three to five dollars.

The Lancer is billed as an advanced RC stunt trainer for operation with a 35 to 51 engine. Wing span is 53½ in., area is 525 sq. in. All-up weight is around 4½ lb. This is [redacted] nice comfortable size, readily stored in a car trunk.

The Lancer was flown with a 35 and proved to be an excellent advanced trainer. It is a good first low-winger. With the 35, it is capable of quite satisfying performance and able to perform most stunt training maneuvers. However, more power is required for real performance. An engine in the 40 to 45 category should handle it well, but 51-power would probably be too much for the beginner.

An extremely hard l[redacted]ding by the builder brought out one slight weakness. The nylon nose gear block shattered, but this was better than tearing out the fire-

wall. Since nothing else was hurt, the main gear, which cants back about 15 degrees from the bottom span, was turned around to place it at [redacted] 15-degree forward cant, and the bird was flown successfully as a tail-dragger.

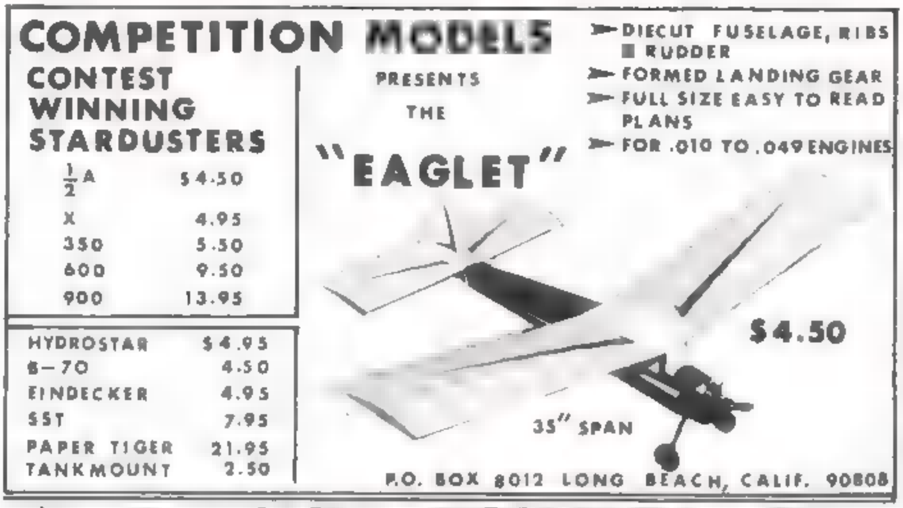
In summary, the Lancer is modestly priced, good quality, a really fine flyer, and economical to operate. The expensive surprise is how quickly [redacted] 60-powered monster consumes a gallon of fuel!

## Hillman Model Air Park

*(continued from page 11)*

The meeting was scheduled at the club's original flying site so that the needs of area fliers could be demonstrated. State engineers, favorably impressed by the demonstration flights and thoroughness of thinking and planning of the ARCS, readily agreed that the club should indeed be [redacted] most important part of the new state park. The fact that ARCS had controlled their old flying site without problems over the years also impressed these men.

Another important factor affecting this favorable decision is the far-thinking approach of the Pennsylvania park planners. Unknown to ARCS, they had decided that the public was ready for "Noise Parks"— [redacted] place where man could use all his noisy modern contrivances without dire consequences to those who wished peace and quiet. ARCS showed the way, mostly through their strict organization and control of the field they'd maintained since 1946. This is one of the main reasons why the club has governing rule of the new state park and full right to lay down the law to others who came to use it. There al-







ready have been minor problems with dune buggy drivers who roared through the park at will until confronted by ARCS members with blood in their eyes. What more could any state park department ask?

Another important factor in determining control of the James F. Hillman Model Air Park was that the AMA stood solidly behind ARCS as [redacted] sanctioning body, not only for chartering, but through full insurance coverage as well. Not many other organizations could approach a state government and make the same conditions available, especially at no cost to the state.

This is what took place in Pittsburgh, and what may happen again in other areas of Pennsylvania. It shows what can be accomplished. Why not work toward drawing your area clubs into an alliance which may provide similar facilities for you? Just remember all the ways the Pittsburgh club went about achieving what they have today.

For complete details or answers to questions regarding such activity in your area, write to Ralph Pennetti, Jr., Wharrey Drive, Sewickley, Penna., 15143, or Dr. Maurice K. Goddard, Department of Forests and Waters, Harrisburg, Penna.

## Ekko

*(continued from page 50)*

oversize wood than with thinner and harder materials. To control weight, select only medium balsa.

Because of the nature of the design, Ekko is not for builders without previous multi experiences. However, those who have built and flown similar aircraft successfully should have no difficulty.

Construction is straightforward and requires little explanation. The wing can be built in one piece, or each half may be built separately, joined at proper dihedral angle when ready for sheeting. The ailerons [redacted] built integrally with each wing half, and then cut out after the sheet covering is completed. The fuselage side panels are prepared with the reinforcements prior to assembly.

To assemble the fuselage, formers FB and FC are first cemented to the sides. The sides are then pulled together at front and rear before the remaining formers, etc., are added. The rest of the building process is quite obvious.

Finishing technique is a matter of personal choice. Whatever method is used, make the model as light as possible. To obtain a long-lasting shining finish, the final fuel-proofer should be of good quality. I used an epoxy-type proofer [redacted] my original model.

There is ample room in the fuselage for any of the new digital systems. Servos are mounted on a 1/8" plywood plate, the plate itself is then fastened on hardwood rails with sheet-metal screws.

Normal checking procedures are followed prior to test flights. The engine downthrust is not critical, and you may start without any off-setting, applying downthrust as needed. The center of gravity is located as shown on the plan. The model must balance no further toward the rear than 3.5 in. from the leading edge.

Flying the ship should not present any problem to those familiar with this type of aircraft. Ekko is exact and responds instantly to commands. Low-speed characteristics are excellent, especially with the engine running. Without power, Ekko may run out of elevator sooner than expected in emergency landings.

## Milk Carton Special

*(continued from page 38)*

two halves even on [redacted] table top and place [redacted] staple outside each edge of the tail extension in the seam. This anchors the alignment of the two halves.

Fold out the four motor mount flaps which are now two thicknesses each. A piece of pine reinforcement is fitted between the top and bottom of the wing at the back of the notch now created. Its dimensions are 1/4 [redacted] 5/16 x 3", the shortest dimension being the height. The wood also is fastened with staples. The motor mount is folded into [redacted] double thickness of the dimensions shown in Fig. 4. It is now placed squarely between the outfolded flaps and is stapled four times to each flap.

The two stabilizers are cut to the dimensions shown and the narrow base portions stapled to the tail extension. The two sides are folded up and stapled temporarily in the middle. The elevator is laid out so that the fixed leading strip falls exactly on the seam of an opened carton. The movable elevator extends away from the rough edge of the seam. Immediately to the rear of this edge, 1/16-in. strips are removed to create the 1/4-in. sections which remain as hinges.

The elevator is cut out now, with [redacted] additional flap the size of the [redacted] left at its leading edge. This flap is folded under and stapled to hide the advertising under the seam and to add strength. Cut a duplicate of the elevator and staple it to the underside to cover print.

Now, cut the tail mount pieces and staple them to the fixed portion of the elevator in such [redacted] position that the elevator will be centered over the twin stabs when the mount's long portions are inserted between the stab's sides (see Fig. 5). For the first model, the tail is evenly aligned and the tail mounts stapled between the stabilizer sides. On later models, the pushrod is inserted and the leadout synchronization adjusted by sliding the elevator back and forth before it is stapled.

The model now is almost ready to fly. Cut a thin firewall of aluminum (as I did) or plywood and drill the hole for an 049 Baby Bee. This is placed behind the milk carton motor mount and the engine fastened from the front. Wire-and-wheels landing gear are sandwiched between the engine and the milk carton.

Basic construction is finished. A tail skid can be added to the rear by stapling the skid between the motor mount and mount flap layers before they are stapled. If the craft is to be used for some time, coat all the cut edges of the cartons with fuel-proofer to prevent oil soaking in these [redacted] This is not necessary if the plane is to be replaced next week. No further finish is needed because milk cartons already [redacted] coated with an excellent fuel-proof plastic. Dope is excellent for painting and decorating.

## Skydancer

*(continued from page 15)*

pod is next on the list for development. One flight was attempted with twin clustered D-13-3 engines for liftoff thrust of 18 lb. The model nosed over off the launch rail and accelerated across the field [redacted] an altitude of about one ft. before the speed built up enough for the elevator to overpower the nose downthrust moment. That experiment has not been repeated!

Construction: The wing, with the aileron servo, is built first. Cut out forms for ribs R-1 and R-13; the forms should be 1/32" undersize from the outline of the airfoil. Use 1 16" plywood and cut in the spar notches. Sandwich balsa strips, alternating 1/32" for ribs and ⅛" for spacers, between the forms and pin it all together. The two spacers between R-1 and R-2 and R-3 should be 1/16" sheet, since the spacing is 1", not 2" as for the others.

Carve the block of ribs and spacers to shape, spar notches and all, then repeat for the other wing; discard the spacers. Cut the tapered spars out of hard 3 32" sheet.

Wing assembly by the following procedure will result in [redacted] warp-free structure. Pin down the lower spar, glue all ribs in place, then glue in the top spar. Ribs R-1 should be set to the dihedral joint angle of 82½ degrees. Glue the leading edges to the ribs. The bottom of the LE should be pinned to the workboard and will act as [redacted] jig later. Trim ribs R-10 through R-13 for the ailerons and install the 3/16" trailing edge. Cut and glue the upper trailing edge sheet in place.

Next, glue the two panels together, bracing them up to [redacted] dihedral angle of 15 degrees. Cut rib R-1 to accept the dihedral brace and glue it in.

Sheet the bottom of the wing and put in the cap strips. Do not carve the LE yet. Pin one panel of the wing down, use the LE as a jig, and sheet the top. Glue in the spar webs [redacted] that side now; let it all set up hard before unpinning. Repeat for the other panel. The wing should now be warp-free and remain so. Carve the LE to shape and sand the wing smooth.

Cut away the area needed for the

servo mount from R-1 and install the servo, pushrods, bellcranks, etc. The pushrods on the original are 8" lengths of Estes launch lug tubing (a very light, strong 5/32" mylar tube) with the 1/16" wire ends simply expoxied inside. Set up the ailerons for about 25 degrees up and 10 degrees down movement. Use a ½" horn on the elevator.

The remainder of the aircraft is standard construction except for the pod and pod mount. The pod is a rear ejection model which reduces the likelihood of a "Red Baron" where the streamer tangles with the model. Two such situations arose with the original Skydancer. In one instance, the pod hung up on the stabilizer but, with the control available, the model landed safely.

The pod is built before the model so that the mount lugs fit their sockets exactly. Dowels must be perfectly parallel to achieve a smooth sliding fit. The shock cord must attach to the bottom rear of the pod mount or the pod will tend to bind. Drill the holes in the nose of the model well oversize and then use the pod itself, well-coated with release agent, to cast the mount holes.

The model is launched from 18" of C-Rail; ignition by a standard 12V launch system. Two launch lugs are epoxied to the top of the fuselage hatch cover, the remainder of the top of the cover is protected by heavy silver foil.

Flying: Skydancer is a sensitive, neutral stability model. When rolled to a bank it will stay there until rolled out. Elevator must be used in conjunction with aileron for turns, but the sharp turns are handy on landing approach.

Mild aerobatics are easy with this glider, although the flat bottom airfoil limits the variety. It is great fun to loop by pushing in a bit of down to gain speed then grab up for the loop. Little altitude is lost because the ship can climb back almost to its starting point after the maneuver.

Rolls can be done, but plenty of speed is needed. As she comes over, push full down to prevent the nose from dropping. This takes practice to get it right.

Inverted flying is also possible for those with strong nerves.

There is some nose down tendency as the model comes up from the launch rail. Be ready to pull a small amount of up elevator at first, but as the model accelerates, begin to hold the nose down to maintain a 70 degrees to 80 degrees climb. The model is down to glide speed at ejection so it should be nosed over to glide about 4½ sec. after final-stage ignition.

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